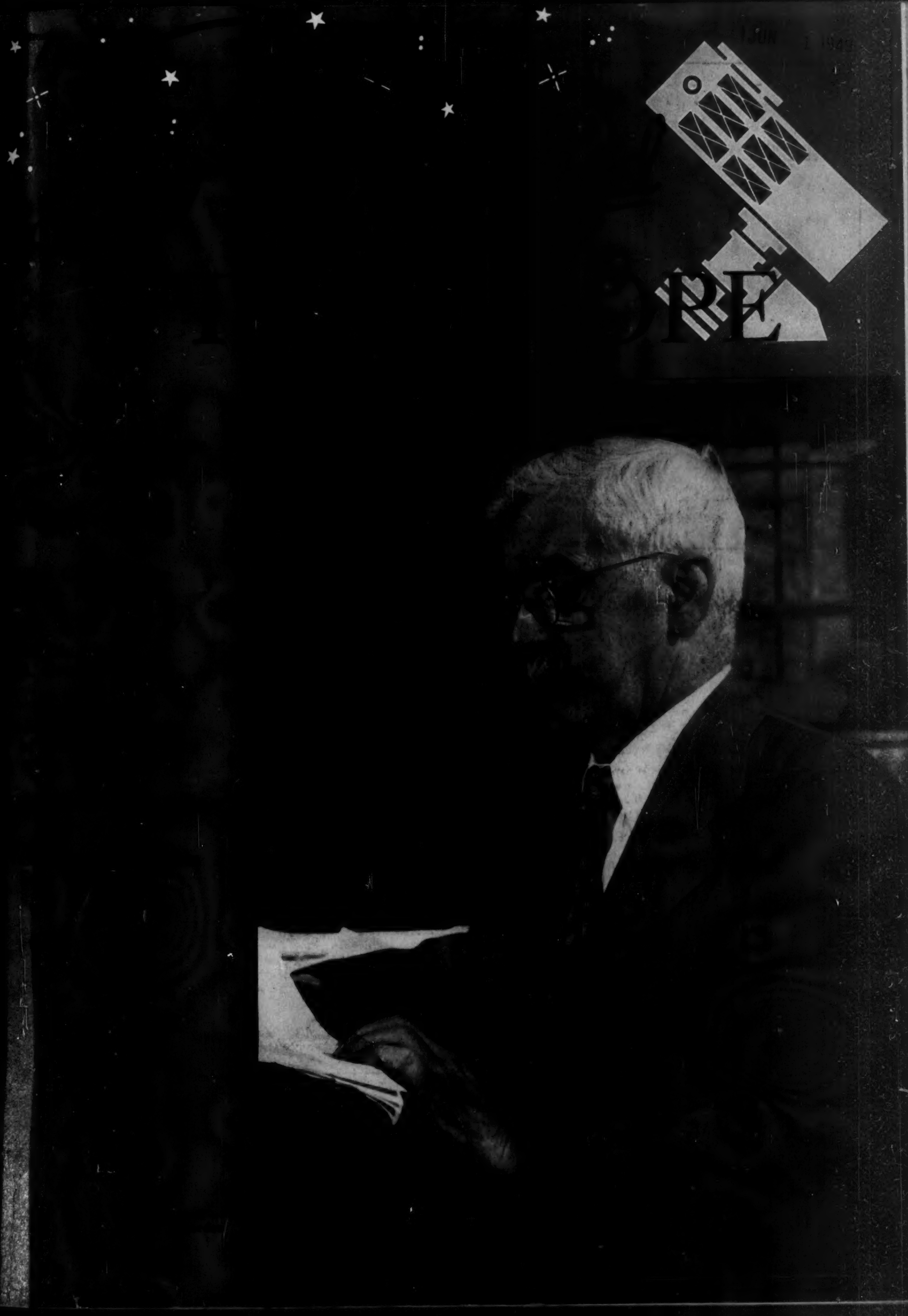
RE

Sky and TELESCOPE

CHARLES A. FEDERER, JR., *Editor*; HELEN S. FEDERER, *Managing Editor*

In Focus

PALOMAR OBSERVATORY has released the first series of photographs taken with the 200-inch Hale reflector and with the 48-inch Schmidt camera. Our back cover shows the well-known spiral galaxy M81, in Ursa Major, which is three million light-years distant and resembles in form and structure our own Milky Way galaxy. The caption released with this picture states that on the original plate the spiral arms are resolved into multitudes of stars which will permit accurate study of the structure of this stellar system. No individual stars can be seen in the central part of the galaxy, the stars there being too close together for present resolution. The total light of the system is estimated to be the equal of about 300 million suns.

The exposure time was one hour, presumably with the full aperture of the 200-inch telescope. The previously most published picture of M81 has been a 4½-hour exposure with the 60-inch reflector at Mount Wilson Observatory (**Splendors of the Sky**, page 31), as the type of mounting of the 100-inch telescope makes it impossible to point that instrument as far north as this galaxy is located, more than 69° north declination.

Compare this picture and others of the same object to find that the field appears reversed, left to right. As in Schmidt camera photographs, the plate was exposed at the prime focus, and only one mirror reversal takes place, instead of the two usual to ordinary Newtonian and Cassegrainian photographs.

In **Collier's** magazine for May 7th there is an article by David O. Woodbury, author of **The Glass Giant of Palomar**, which is illustrated by some Palomar first pictures. The Andromeda galaxy, M31, as photographed by the 48-inch Schmidt, is shown, and a field of very distant galaxies, among which are some on the order of a thousand million light-years away. Another article in the same issue describes "The Men of Palomar," by John Kord Lagemann, and is amply illustrated.

On May 5th it was announced that astronomers on Palomar Mountain were completing arrangements to remove the 200-inch mirror from the telescope in order to refigure a zone 18 inches wide around the outer edge of the mirror. This comprises more than one third of the usable area of the mirror's entire surface. Even at the highest point only about 20 millionths of an inch of glass will be removed, and over much of the band an even smaller amount will be worked down. The task will be done in the observatory itself, and will require as long as six months.

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CONTENTS

COVER: Leon Campbell, Pickering Memorial Astronomer and recorder of the American Association of Variable Star Observers, at his desk in Building A, Harvard College Observatory, where he has this year completed half a century of astronomical activity. Harvard University News Office photo by Walter R. Fleischer. (See page 191.)

BACK COVER: The spiral galaxy NGC 3031, M81, in Ursa Major, photographed at the prime focus of the 200-inch telescope at Palomar Mountain Observatory. Mount Wilson and Palomar Observatories photograph, courtesy California Institute of Technology. (See In Focus.)

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The first meeting of the AAVSO at Harvard, in November, 1915. Left to right are Burbeck, Spinney, D. B. Pickering, Bouton (front), McAteer (behind Bouton), Bailey, Olcott, E. C. Pickering, Nolte, Campbell (front), and Stuart.

FIFTY YEARS AT HCO

BY MARGARET HARWOOD

Maria Mitchell Observatory

IN DECEMBER, 1898, Professor O. C. Wendell, of the Harvard Observatory, made one of his periodic visits to the office of the Cambridge High School. He was in search for a youth sufficiently interested in astronomy to be willing to sit night after night in the dome of the 15-inch equatorial telescope recording photometric observations of variable stars, double stars, asteroids, and eclipses of Jupiter's satellites. A young man who had graduated the previous June was recommended, and without hesitancy Leon Campbell accepted. This seemed to be the opportunity for which he had longed during six months of work in a grocery store. He would now be able to study and work in astronomy to his heart's desire.

Leon's senior year in high school had been made memorable by a course in astronomy taught by Miss Esther Dodge, who had graduated from Boston University the previous June. The school's 4-inch telescope was resurrected from years of idleness and taken to the Alvan Clark Company to be put in order. The first series of observations, the progress of a group of sunspots across the disk of the sun, kindled in at least one of her pupils an enduring interest.

Accordingly, on January 3, 1899, Leon Campbell entered the west door of Harvard Observatory, into what is now designated Building A. He was given desk space at the long table in the library. Through the rest of that winter and for six years, in the cold of winter and the heat of summer, Campbell did Professor Wendell's bidding, always being on hand to record, to work up the observations during the day and on cloudy nights, and to assist in preparing results for publication. There was never a night so stormy but Professor Wendell was at the observatory ready to observe, and so must his aide be also.

To Professor Wendell the 15-inch was an admired and intimate friend. In his enthusiasm to demonstrate its possibilities, he unconsciously taught his eager young assistant to use the telescope. But when it came to observing, Professor Wendell would not allow anyone but himself to honor the Great Refractor.

Undaunted by this restriction, Leon used interims between recordings to step out on a balcony of the dome to make his own measures of variable stars. First, in the spring of 1899, he made estimates with either the naked eye or a field glass of such stars as Mira Ceti and Chi Cygni, stars which at maximum are brighter than the 6th magnitude. Later, he was allowed to use a 5-inch portable telescope in the same way. He was soon observing 75 stars, including the peculiar variables U Geminorum, SS Cygni, and R Scuti. These were also being followed by several other members of the staff and by eight outside observers.

The observations made between 1902 and 1905, as well as the sequences of comparison stars, were collected by Campbell and published in Volume 57 of the *Annals* of Harvard College Observatory. He himself made the largest proportion of the 8,400 observations. He observed the bright Nova Persei No. 2 from the time of its outburst in February, 1901, and in Harvard *Annals 48*, 2, compiled and discussed 5,389 observations.

As early as 1882 and periodically afterwards Director E. C. Pickering issued circulars explaining the necessity of frequent observations of long-period variables and urging that persons having access to telescopes should take up this useful pastime. Consequently, there was a gradual but steady increase in the number of trained astronomers as well as amateurs who sent variable star observations to Harvard.

There was need for another large telescope to augment Professor Wendell's work with the 15-inch of measuring the magnitudes of variables which at minimum cannot be seen with small telescopes. Therefore, in January, 1905, Campbell was released from his post as dome assistant and was assigned to work with the new 24-inch reflector. Then began an extensive program of observing 328 variable stars of long period. No small part of variable star work is the selection and measurement of a sequence of 15 or 20 comparison stars for each variable; as the observing list increases in length, so must the list of comparison stars. In all this Leon did the lion's share. At the end of five years he had made at least 12,000 of the 23,000 observations which he published in Volume 63 of the *Annals*.

In 1911, Campbell went to Arequipa, Peru, to take charge of the southern station of the Harvard Observatory. This was a radical change and an interesting experience. But living conditions must have made it a strenuous existence with a young family; he had married Miss Fredrica J. Thompson, of Columbia, Conn., in 1905. They have five children.

Since four photographic telescopes had to be kept in operation in Peru, there was not much time nor was there the equipment for visual observing. But Leon did all that was possible with a

Harvard Observatory in Cambridge early in the 20th century. The awning is at the entrance to Building A, and to the right of the entrance are the present headquarters of the AAVSO.

5-inch portable, and he kept in touch with the amateur observers in the United States, for they had now organized to form the American Association of Variable Star Observers (founded in 1911). He worked out a plan for the members to join in a systematic search for bright novae.

Campbell was the first discoverer of Comet 1914e, a naked-eye object of the 4th magnitude when it was first seen on September 18th. It had passed perihelion on August 5th and was at its nearest approach to the earth (within 25 million miles) when discovered. It moved northward fast, and was not seen after October 13th.

Professor Wendell died in 1912, and in 1915 Campbell returned to Cambridge and took charge of both photometric and visual work with the 15-inch equatorial and the 12-inch polar telescopes. He used the polarizing photometer on the Great Refractor to measure the brightness of planets, asteroids, novae, and various peculiar objects. In 1917, he published results of settings on Uranus in order to test the constancy of the sun's brightness. This followed the suggestion of Professor Pickering that any conspicuous variations in the total solar radiation should be revealed by accurate photometry of this planet, whose light could be compared directly with that of neighboring stars. Campbell found a periodic variation of 0.15 magnitude in 0.451 day. But this agrees with the period of rotation of Uranus found spectrographically at the Lowell Observatory in 1912. He had obtained two valuable results: a confirmation of the period of rotation, and the discovery that Uranus has surface markings.

Variable stars, including novae, were then as now Leon Campbell's specialty, and from the time he returned to Cambridge he has maintained the close relationship between the AAVSO and Harvard Observatory. By so doing he has increased the number and quality of the observations made by amateurs and has secured for the observatory an almost complete record during 50 years of each of 400 variable stars. These include the observations and light curves of all bright novae and 12 peculiar variables. Of the latter the most notable is SS Cygni, every maximum of which has been observed since its discovery in 1896.

In spite of a heavy observing program, Campbell found time to work out and analyze periods and light curves, to predict maxima and minima, and to publish all results. Also, he took time from what should have been his leisure to teach new members how to use a telescope, how to make and record observations. And he frequently traveled long distances to help an amateur, not necessarily a member of the AAVSO, adjust his telescope or find and repair some mechanical difficulty.

Increasing requests for portable telescopes caused him to establish privately the Telescope Mart, which filled a great need as a clearinghouse for visual telescopes both old and new. His customers have usually become members of the AAVSO, the Bond Astronomical Club, or the Amateur Telescope Makers of Boston. With the last-named societies, as well as with the AAVSO, he has always been the "liaison officer" who has fostered relations with the observatory. His fund of practical knowledge and thorough knowledge of his subject render him a valuable and active member of the Harvard staff and of these societies. "Ask Mr. Campbell," is the common solution to many problems which arise in the observatory itself — he is never too busy to be interrupted by a call for information and assistance.

Leon Campbell became the third president of the American Association of Variable Star Observers at the annual meeting in October, 1919. In 1925, he took on all the duties of recording secretary, and shortly thereafter he was given the permanent position and title of recorder. The number of observations from all over the world increased so fast that in 1927 he found it necessary to give up regular observing. But he has continued to make photometric measures of special objects, as, for instance, the asteroid Eros during its near approaches in 1931 and 1938. In 1928 Campbell was appointed instructor in

Leon Campbell acknowledges honors and gifts bestowed upon him at the dinner given January 29th in Cambridge. Left to right are Dr. A. Navez, Miss Esther Dodge, Mr. Campbell, Dr. Harlow Shapley, Mrs. Campbell, and Dr. D. H. Menzel.

astronomy, and in 1931 Harvard made him Pickering Memorial Astronomer.

The number of observations of variable stars which Campbell has collected, plotted, and discussed in the last 37 years for the AAVSO is now nearly 1,150,000. To this should be added 41,401, the number he published in the seven years before the association was founded.

I wish there were space to describe many of the 95 articles and notes published by "L. C." in Harvard *Annals, Bulletins,* and *Circulars,* in *Popular Astronomy, The Telescope,* and in *Sky and Telescope,* apart from his regular AAVSO contributions. The latter are contained in monthly reports of the AAVSO in *Popular Astronomy,* Harvard *Bulletins* and *Circulars,* and in AAVSO *Bulletins.* There are semiannual reports in *Variable Comments,* and five volumes of Harvard *Annals* deal with AAVSO results. All of these writings add up to more than 1,500 separate articles. The monthly report in *Popular Astronomy* gives a valuable resume of the literature of all types of variable stars.

Leon Campbell is joint author with Luigi Jacchia of *The Story of Variable Stars,* Blakiston, 1941 and 1946. He is a member of the variable star commission of the International Astronomical Union, and of the American Astronomical Society. He is an honorary member of the Bond Astronomical Club, and of the Sociedad Astronomica de Mexico.

On January 3, 1949, Leon Campbell had been 50 years a member of the staff of the Harvard College Observatory, and on January 29th a dinner was given by his past and present associates at Harvard. He was honored not merely because in the history of the observatory his length of service has been exceeded only by those of Professors Arthur Searle and Willard P. Gerrish, or because January 20th was his 68th birthday, but because we wanted to show him our appreciation and affection.

At present, Mr. Campbell occupies the same room as when he came half a century ago, for the room has been changed from the library of the observatory to the library and office of the AAVSO. Although he has remained at one desk and is the same unselfish person, untiring in his efforts for others and for his beloved science, he made the most of his opportunities; he grew until his influence is at present felt around the world.

NEW NEPTUNE SATELLITE?

Harvard Announcement Card 994 transmits a telegram received from Dr. G. P. Kuiper, McDonald Observatory, on May 5th: "Plates taken on May 1st show object magnitude about 19 to 20, being 168 seconds west 112 seconds north of Neptune and having nearly same motion as planet. Additional work scheduled to determine whether object is a new satellite."

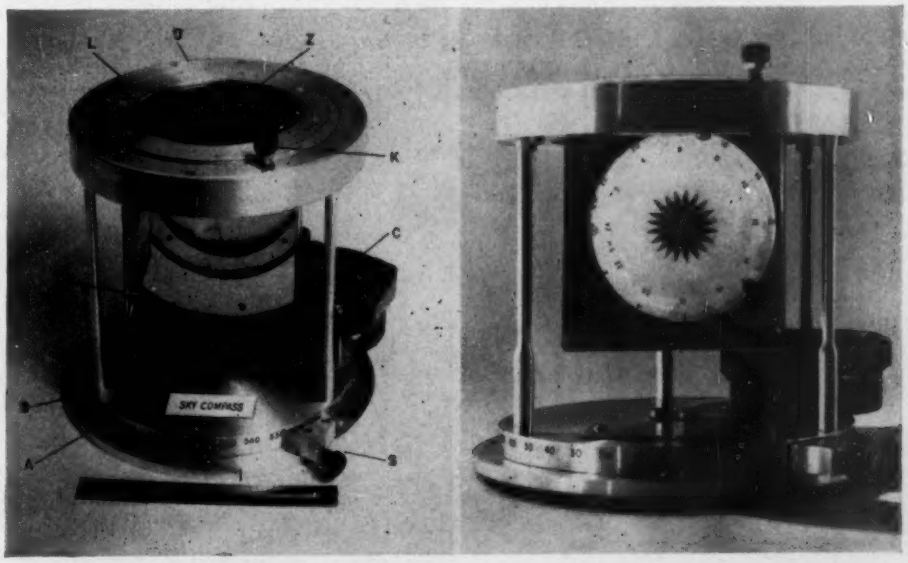
A Sky Compass for Polar Navigation

IN polar regions, navigation has been handicapped by two factors. First, the magnetic compass is not reliable there because of the weakness and variability of the horizontal component of the earth's magnetic field. Second, during the long twilight periods neither the sun nor the stars are visible for direction finding. A new sky compass developed by the National Bureau of Standards makes use of the polarization of skylight and escapes the disadvantages of some other methods. The new device is based on work by the late A. H. Pfund, of Johns Hopkins University, and is an outgrowth of his twilight sextant.

The light of the sky is partially plane-polarized with maximum polarization in the plane containing both the sun and the observer. If skylight is examined through a rotating sheet of polaroid, two positions of the polaroid will show maximum and two will show minimum transmission of light. However, it is difficult to judge the exact positions of maximum or minimum intensity accurately. Hence the sky compass utilizes an analyzer consisting of a half-wave plate of cellophane covering part of the polaroid. The purpose of the analyzer is to rotate the plane of polarization by amounts depending on the orientation of its axis to that of the plane of polarization. As the analyzer is rotated, the intensity of light passing through both it and the polaroid varies relative to that passing through the polaroid alone.

The light which passes through the half-wave plate appears in the form of a star at the center of the field of view and against the background of light which has passed only through the polaroid. At four points in a complete revolution with respect to the plane of polarization, the intensity in the two light paths is the same, and the field blends into a homogeneous whole. Two of these matches (at right angles to the plane of polarization) are "dark," and the other two are "light," and these latter determine the plane including the sun.

Thus, the direction of the sun may be determined, even though it may be hidden by clouds or may be as much as seven degrees below the horizon. The method is applicable even in cloudy weather provided only a small patch of clear sky is visible near the zenith. In conjunction with azimuth tables, the accuracy in determining the solar azimuth is about one degree, with somewhat less accuracy in an airplane because of difficulties in leveling. As either the north or south pole is approached, the accuracy increases, because of the lower altitude of the sun and because the deviation of the sun's azimuth from that corresponding to local apparent time is negligible.



Pfund sky compass parts are: A, azimuth scale; B, base; C, clock for rotating polaroid analyzer Z with the sun; D, time scale; I and L, indices for the azimuth and clock scales, respectively; S, azimuth setting clamp; K, knob for rotating viewing mirror M. At right is a view through the mirror of the analyzing polaroid unit. To obtain the heading indicated on the azimuth scale, the instrument as a whole must be rotated so the intensity of the transmitted polarized light through the central star and background are equal. Photographs courtesy of the National Bureau of Standards.

Amateur Astronomers

Final Details on the Convention in Cleveland

Convention Program

The program for the three-day convention in Cleveland of the Astronomical League on July 2-4 is essentially complete, although as we go to press details of section meeting speakers and the program of papers are not available. Registration will be in the physics building entrance hall at Case Institute of Technology, and convention sessions are scheduled for the lecture hall of the same building.

Saturday, July 2

8:00- 9:00 a.m.	Registration of delegates from Middle East region
8:00- 9:45	National council meeting
9:00-10:00	Middle East regional meeting, first session
9:00-10:00	General registration for convention
10:15-12:15 p.m.	Opening session, roll call, general business, reports of officers
2:00- 3:30	Session for papers
3:45- 5:15	Section meeting on solar work
6:00	Convention dinner — Crystal Ballroom, Tudor Arms Hotel
7:15	Address, "The Expanding Milky Way," Dr. S. W. McCuskey, of Warner and Swasey Observatory. Crystal Ballroom.
8:30	Star party in Wade Park, weather permitting

Sunday, July 3

8:30-10:00 a.m.	National council meeting
10:00-12:00	Section meeting on lunar and planetary observing
12:10 p.m.	Group photograph
2:00- 3:30	General session; conclusion of papers
3:45- 5:15	Section meeting on observing variable and double stars
6:30- 8:00	National council meeting
7:30	Open house at Warner and Swasey Observatory, East Cleveland, and at Junior Astronomy Club workshop, Cleveland Museum of Natural History

Monday, July 4

9:30-11:00 a.m.	Business meeting; election of officers, selection of 1950 convention site
11:00-12:30 p.m.	Awarding of exhibit prizes, followed by an informal panel on instrumentation conducted by exhibit prizewinners and consultants in the instruments clinic
12:30	Resolutions. Adjournment of general convention
12:45- 2:00	National council meeting
2:00- 3:30	Middle East regional meeting, second session. Election of regional officers

Advance Registration

For several events at the convention in Cleveland, advance registration is necessary. Attention is therefore called to the following points, and to *the deadline of June 12th for mailing all such registrations.*

1. All delegates and guests planning to attend the convention should write Royce Parkin, Cleveland Convention Chairman, Tudor Arms Hotel, Cleveland 6, Ohio, advising the number in each party or group. At the same time, reservations should be made for the number of persons who will be attending the convention banquet on Saturday evening, July 2nd. (Place, Tudor Arms Hotel; cost, $3.00 per plate all inclusive; tickets to be paid for at the time of convention registration in Cleveland.)

2. In addition to the hotel accommodations announced in last month's *Sky and Telescope,* for which reservations are to be made directly with the hotel concerned, arrangements have been made with the assistance of the Cleveland Convention Bureau for delegates to reserve rooms in selected private homes at somewhat lower rates. Anyone wishing such rooms should write to Mr. Parkin, stating the number of persons in the party, the accommodations desired, and for what nights.

3. Persons or societies wishing to submit exhibits should communicate with Leo N. Schoenig, 825 Tripoli St., Pittsburgh 12, Pa., enclosing entry fee. (See *Sky and Telescope,* May issue, for details on the exhibit and exhibit rules.)

Committees

The general convention committee has been made up of Mr. Parkin, representing the Cleveland Astronomical Society, R. R. LaPelle, activities chairman of the Astronomical League, and C. H. LeRoy, chairman of the Middle East region. The exhibit is under the cochairmanship of Mr. Schoenig, for the league, and James L. Russell, of the Cleveland Astronomical Society. With David Dietz as chairman, the Saturday evening star party will be jointly sponsored by the Cleveland *Press,* the Cleveland Astronomical Society, and the Astronomical League. Dr. J. J. Nassau, president of the society, is chairman of the Sunday evening field trips. Mr. LaPelle will act as chairman of the exhibit judging committee, with Dr. Paul Annear, of Baldwin-Wallace College, and two other judges.

THIS MONTH'S MEETINGS

Chicago, Ill.: On Tuesday, June 14th, members of the Burnham Astronomical Society and invited friends will be guests of the Adler Planetarium, with a special demonstration by Director Wagner Schlesinger, at 8:00 p.m. Members are requested to bring telescopes for observation at the close of the demonstration.

Cleveland, Ohio: The concluding public nights in the 1948-49 series of the Warner and Swasey Observatory will be on June 2nd and 3rd, when the topic is "The Summer Sky." For reservations, call Tyler 1-1000.

Detroit, Mich.: On Sunday, June 5th, the Detroit Astronomical Society will make its annual visit to the Cranbrook Institute of Science. There will be celestial observing at nightfall. Details may be obtained from the president-secretary, Mrs. Margaret Back, 94 Merriweather Road, Grosse Pointe Farms.

Geneva, Ill.: A 5 o'clock lecture by Wagner Schlesinger, Adler Planetarium, on "The Fringes of the Universe," will open the Fox Valley Astronomical Society picnic on June 11th at Aurora College. There will be a picnic supper at 6:30, and observations beginning at 8:00.

Indianapolis, Ind.: The Indiana Astronomical Society will meet on June 5th at the Link Observatory, in Brooklyn, Ind., when Walter Wilkins will be the speaker.

Kalamazoo, Mich.: On June 18th at 8:00 p.m., the Kalamazoo Amateur Astronomical Association will meet at the home of Mr. and Mrs. James Sigler, 211 Seydelle Ave., when Jerome Korman will speak on "The Chemistry of the Stars," and Mr. Sigler will discuss "Late Developments of the Hale Telescope."

Los Angeles: Dr. Daniel Popper, University of California, will speak on "Rotation of the Galaxy" at the June 14th meeting of the Los Angeles Astronomical Society, 7:45 p.m., Griffith Observatory.

Madison, Wis.: June 8th is the date for election of officers in the Madison Astronomical Society, and the society picnic will be held at a place to be announced.

New Haven, Conn.: A picnic supper will be held by the New Haven Amateur Astronomical Society on June 11th, following which motion pictures will be shown.

Pittsburgh, Pa.: The program for the June 10th meeting of the Amateur Astronomers Association of Pittsburgh, in the lecture hall of the Buhl Planetarium, includes celebration of the 20th anniversary, and installation of officers for the year.

San Diego, Calif.: Professor William T. Skilling will speak on unusual and peculiar stars, "The Mavericks of the Sky," Friday evening, June 3rd, at 7:30 before the San Diego Astronomical Society, in Room 504 of the Gas and Electric Building. Visitors are welcome.

Stamford, Conn.: At 8:00 p.m. on June 17th, Robert E. Cox, of Harvard College Observatory, will lecture to the members of the Stamford Amateur Astronomers at the Stamford Museum. His subject is "Astronomical Photography at a Large Observatory."

Washington, D. C.: Dr. James A. Van Allen, of the Johns Hopkins Applied Physics Laboratory, will lecture at the meeting of the National Capital Astronomers on Saturday, June 4th, at 8:15 p.m. in the Commerce Department auditorium. His subject will be "Cosmic Rays Above the Atmosphere."

Delegates to the second convention of the Northeast region of the Astronomical League, New York City, April 23, 1949. Photo by Robert E. Cox.

NORTHEAST REGION CONVENES AT NEW YORK

MORE than 100 persons registered at the second regional convention of the Northeast region of the Astronomical League, held in the American Museum of Natural History on the weekend of April 23-24. The host organizations were the Bergen County Astronomical Society and the Junior Astronomy Club.

On Saturday afternoon section meetings were held on instruments, programs, and observing. John Streeter, of Vassar College Observatory, suggested the use of filters for observations of the moon and planets. Eastman Kodak light-green X2 filters should serve well with refractors in observing the planets; a darker B filter may also be used; for the moon a dense N filter is useful. For precise observations "A" quality filters should be obtained from the manufacturer, the "B" quality being usually available commercially.

Rolland R. LaPelle, of Springfield, Mass., gave a talk on mountings before the instruments section, and another talk on magnitude estimates of the satellites of Saturn before the observing section. Roy A. Seely described the variable star and nova search programs of the AAVSO.

Vincent Anyzeski, of the New Haven Amateur Astronomical Society, described a novel device to assist in teaching constellations to beginners. As shown here, two oatmeal boxes are mounted together to form two open tubes, one for the instructor to look through while the student looks through the other at any selected constellation or area in the sky. Most constellations are not too large to fit into the field of view provided by the tubes.

Saturday evening the delegates participated in a series of field trips to the Rutherfurd Observatory of Columbia University, the Bergen County Astronomical Society Observatory in Teaneck, N. J., the Fordham University seismograph station, and the Watson Scientific Computing Laboratories.

The program on Sunday included a business session followed by a lecture by Dr. Bart J. Bok, associate director of Harvard Observatory, who spoke on "The Center of Our Galaxy." Officers elected for the Northeast region for the coming year are: Chester S. Cook, chairman (re-elected); William A. Miller, vice-chairman; Mrs. Lois S. Lee, secretary; and Mrs. Grace C. Rademacher, treasurer.

The novel constellation observer constructed by Vincent Anyzeski from oatmeal boxes. Photo by Robert E. Cox.

PLANETARIUM AT BUFFALO

On April 24th, the Buffalo Museum of Science opened the latest addition to its hall of astronomy, a Spitz planetarium. The dome is of plywood rib construction, 18 feet in diameter, covered with cloth and painted flat white; the lower edge of the dome is approximately six feet above the floor. The seating capacity is about 30. Armand Spitz, of the Franklin Institute in Philadelphia and inventor of the planetarium, was a guest of honor at the opening ceremonies. While some of the several hundred persons attending heard the first lectures in the planetarium, two showings of the color motion picture, The Story of Palomar, were given.

Mr. Spitz gave several brief lectures in the planetarium and then turned the instrument officially over to the Amateur Telescope Makers and Observers of Buffalo, who will conduct the weekly lectures, scheduled for Sunday afternoons from 2:00 to 5:30 p.m. The May lecture was entitled, "Early Summer Sky with a Trip to Alaska and Florida." Admission to the Buffalo Museum of Science Planetarium is free. For special lecture arrangements, groups should address Elsworth Jaeger, director of education at the museum.

WILLIAM C. OBEREM
Buffalo ATM's & O's

ASTRONOMICAL LEAGUE EMBLEM

In the executive secretary's bulletin of May 3rd it is announced that the Astronomical League is sponsoring a contest to procure a suitable emblem design. The chairman of the emblem committee, who will receive designs, is E. S. Hider, 476 Longridge Drive, Pittsburgh 16, Pa. Other committee members are Miss Katharine Hendrie, Amateur Telescope Makers of Boston, and Mrs. Cecil Post, Amateur Telescope Makers and Observers of Portland, Ore.

Local organizations may sponsor contests within their groups and submit the best designs for national consideration, or individuals may send in designs. The emblem may be of any shape, with lettering to be of national and international character and not to bear reference to any particular region. The design should reduce well to not more than three quarters of an inch in diameter, for stationery and publications, and for possible use on pins and buttons. All drawings or sketches should measure about three inches (scale one inch equals one quarter inch), with black lettering and only one other color. A small sketch to actual size must also be furnished. Designs should be drawn or mounted on white cardboard.

While no deadline has yet been set for the receipt of designs, it is possible that those submitted in time will be displayed at the Cleveland convention.

PLANACROSTIC

At the annual dinner of the Amateur Astronomers Association, New York, on April 22nd, a "Planacrostic" contest was held to procure a mnemonic for the order of the names of the planets, including the asteroids. Arthur Downing submitted the winning entry with the sentence: "Many Very Early Men Ate Juicy Steaks Using No Plates."

NEWS NOTES

By Dorrit Hoffleit

ECLIPSES AND QUAKES

Coincidences often lead to speculation and theories on cause and effect. This was true on the West Coast when the recent lunar eclipse was followed only hours later by the severe Pacific Northwest earthquake. Seismologists at the Berkeley meetings of the Seismological Society of America debated the possibilities of the eclipse and of "earthquake weather" as trigger actions for setting off quakes. One geologist explained that the lowering of barometric pressure when a low-pressure area moves in may make a difference of thousands of pounds per square yard. This might be "the straw that breaks the camel's back." However, these phenomena can at most set off an inevitable quake a bit sooner than it would have occurred anyway. As for the eclipse and the effects of the concomitant tidal forces, the savants pointed out that many eclipses have gone by unassociated with any quakes, while most of the major earthquakes have occurred without the benefit of an eclipse.

ORIGIN OF COMETS

Dust clouds in space have become looked upon as the stockpiles for the creation of all sorts of celestial objects. Only a few years ago "globules" in the Milky Way were first suggested as protostars. Recently, in a paper presented to the Royal Astronomical Society (*Observatory,* February, 1949), Dr. R. A. Lyttleton, of Cambridge University, proposed the simultaneous formation and capture of comets by the sun whenever it passes through a dust cloud in its journey through space.

"As the particles of the cloud enter the Sun's gravitational field, their relative motion will be converted from motion in parallel lines to motion in hyperbolic orbits which converge to the line through the Sun parallel to the original relative velocity; this line is called the accretion axis. Such a situation is clearly very favourable for collisions at and near the axis. . . . The velocities transverse to the axis are destroyed by collisions, and material will be captured within a certain distance from the Sun. For it to be captured in solid form the velocity at collisions must not be so high that complete vaporisation occurs. This places a lower limit of about twenty astronomical units for the distance at which material in suitable form is captured."

Dr. Lyttleton then states that the accretion process itself sets an upper limit of the order of a thousand astronomical units. Finally, he points out that if the basic idea of his theory is correct, comets may be the most numerous of celestial objects.

SECOND NEAREST STAR

A red dwarf double star has been found in the constellation of Cetus that may prove to be the second nearest star to the solar system. Dr. W. J. Luyten, of the University of Minnesota, on one of the last pairs of Harvard plates examined in the Bruce proper motion survey, found the star, L 726-8, to possess the large apparent motion of 3.37 seconds of arc per year (direction 80°). Its position is at $1^h\ 36^m.4$, $-18°\ 13'$ (1950), and its apparent magnitude is 11.93 photovisual and 13.69 photographic.

For the trigonometric determination of the star's distance, parallax plates were taken by Dr. E. F. Carpenter with the 36-inch reflector at Steward Observatory in Arizona. These were measured at Minnesota and yielded a value of $0''.56$ (probable error $0''.07$) for the parallax, which, if substantiated, would place this star closer than Barnard's star, which is at a distance of 6.1 light-years (parallax $0''.530$). Only Alpha Centauri, 4.3 light-years from us, would be nearer than L 726-8.

Astronomers find the newly discovered system of special interest, for on December 7th, last year, the fainter component appears to have flared up to 12 times its normal brilliance and to have subsided again in about 20 minutes. This phenomenon may be connected with the fact that the d*M*6e spectrum of the star shows emission (bright lines) in hydrogen and calcium.

This field of faint stars was photographed by Dr. W. J. Luyten with the 36-inch telescope of the University of Arizona on September 24, 1948. The arrow indicates L 726-8, less than six light-years away from us. North is at the top, where the star with a faint companion is BD −18° 279.

ANTIPODAL STATIONS FOR IONOSPHERIC PREDICTION

The National Bureau of Standards has the task of predicting propagation conditions for long-range radio transmission. Daily soundings of the ionosphere are made all over the world by an international network of 53 stations, 14 of which are operated or supported by the bureau. Work by Gladys White and R. F. Potter confirms that ionospheric characteristics observed at a particular station at any given season of the year are closely simulated by the characteristics at a station on the opposite place on the earth's surface for the corresponding season. For example, in the years 1944 to 1947, December solstice observations at Baton Rouge, La., corresponded with the June solstice observations at Watheroo, Western Australia.

This important analysis effectively doubles the available number of ionospheric sounding stations for radio prediction purposes, and further observations are desirable completely to establish the exact relation between various antipodal stations.

OPTICAL GLASS

Optical glass production in the United States is an industry scarcely over half a century old, and the National Bureau of Standards has been working in this field since 1914. Its *Circular 469,* by Francis W. Glaze and Clarence H. Hahner, gives a valuable description of the plant at the bureau and a sufficient account of production procedures "to enable one experienced in the trade to enter the optical glass field with some hope of success."

Prior to 1939, the bureau had supplied the Navy with five types of optical glass; during the war it furnished 28 different types to the armed services. For most of these the requirements had become increasingly stringent both as regards tolerances in the index of refraction and freedom from minor blemishes. Now optical glasses transmitting ultraviolet and infrared are much desired, indicating that chemical constituents not previously used will come into play. The authors point out that there remains enough research work to satisfy the enthusiastic investigator for years.

NOVA IN SCORPIUS

On a patrol camera plate taken March 23rd at the National Astrophysical Observatory, Tonanzintla, Mexico, a nova of magnitude 7.5 has been discovered. Its position on a Cordoba chart is at $17^h\ 51^m.8$, $-38°\ 59'$, and on a patrol plate of the region taken the preceding night there is no star in the nova's position, although the limiting magnitude of the plate was 12.5. By March 29th the star had faded to magnitude about 9.5.

WITH THE UNEXPECTED passing of Dr. J. H. Moore, astronomer emeritus and director emeritus of the Lick Observatory, something besides his mortal self left the community on this mountaintop. A certain undefinable attitude inherent since the beginning of the observatory in the late 1880's and characterizing the life and living of the astronomical community of Mt. Hamilton left us also.

"Doc," as Joseph Haines Moore was called by everyone, young or old, newcomer or long resident here, was the vital link between the early pioneer and the later younger generations.

In July of 1903, he came to Lick as an assistant to the late W. W. Campbell. He had just received his Ph.D. in physics from Johns Hopkins, where he had pursued his graduate work under Rowland, Ames, Wood, and others of the outstanding galaxy of scholars of that famous graduate school. From 1903 to 1906, he was "the" assistant to Director Campbell, who in those years was embarking on the stupendous stellar radial velocities program that occupied the Lick Observatory for over 25 years.

Moore's training under Rowland as spectroscopist soon showed itself in the continual improvement of the quality of the spectrograms secured. Under Moore's supervision the spectrographic instruments were kept under constant control; and the measurement and tedious reductions of the spectrograms soon became a smoothly organized working program that could hardly be duplicated in modern astronomical investigations.

In 1906 he became assistant astronomer, and a year later Miss Fredrica Chase, a Vassar graduate and an assistant at the observatory, and Dr. Moore were married. This remained a remarkable union, for it was a rare and wonderful combination of homemaking and professional teamwork.

In 1909, Dr. and Mrs. Moore went to take charge of the Southern Hemisphere station of Lick Observatory at Santiago, Chile, where they remained for nearly four years. During their stay there much work was accomplished due to their combined efforts, both in observing and in the reductions of the observations.

The Moores returned to California in 1913, and during the next five years Dr. Moore gradually brought to a conclusion the original Lick radial velocity program. In 1918 he was made associate astronomer, and at that time he published with Campbell as joint author the results of "Spectrographic Velocities of the Bright Line Nebulae," Part IV of Volume 13 of *Publications* of the Lick Observatory. When in 1923 Dr. Campbell was made president of the University of California, Dr. Moore was promoted to astronomer and placed in charge of the spectrographic work of

The sunbaked top of Mt. Hamilton, showing some of the Lick Observatory buildings, dominated by the dome of the 36-inch refractor. Photo by the editor.

J. H. MOORE - A Good Neighbor

By F. J. Neubauer, *Lick Observatory*

the observatory. He was joint author with Campbell of Volume 16 of the *Publications,* on stellar radial velocities, in 1928. In 1932, he published Volume 18, "A General Catalogue of the Radial Velocities of Stars, Nebulae, and Clusters," a work which will be his memorial in the astronomical world for many years to come.

His written publications appeared chiefly in the observatory's own *Bulletins* and *Publications.* Of the former, the principal numbers are "Radial Velocities of 25 Stars of Secchi's Fourth Type" (1922), and the third, fourth, and fifth catalogues of spectroscopic binaries, published in 1924, 1936, and 1948, respectively. His other publications in various astronomical and technical journals are too numerous to record here.

Joseph Haines Moore (1878-1949).

In 1918, Moore was a member of the Goldendale eclipse expedition, and he went with Trumpler and Campbell on the eclipse expedition to Western Australia in 1922, and again to Mexico in 1923. He led the Lick Observatory eclipse expeditions to Camptonville, Calif., in 1930, and to Fryeburg, Me., in 1932.

During his professional career he served as president (twice) and vice-president of the Astronomical Society of the Pacific, and as vice-president of the American Astronomical Society. In 1931 he was elected to membership in the National Academy of Sciences. Dr. Moore was assistant director of the Lick Observatory from 1936 to 1942, and director from 1942 to 1946. He retired from the directorship because of poor health, and when his doctor recommended a change of residence, the Moores moved to Oakland. They secured a beautiful home at this lower altitude, and Doc kept his office at the Students' Observatory on the Berkeley campus of the University of California. We all noticed a great improvement in his health, and he looked toward his final retirement with joyous plans about his garden and flowers (especially petunias).

J. H. Moore was a very companion-

able man, always friendly and helpful, and a good neighbor. In spite of his many travels he never liked to travel, for it took him away from his home. Dr. Moore was a patient professor and he gave students much encouragement and help while they were preparing to come to Lick.

Shortly before Moore's retirement in September, 1948, Director and Mrs. C. D. Shane gave a party for the Moores here on the mountain. Everyone had a typical old-time Mt. Hamilton good time. The writer was selected to make a presentation talk and all he could think of saying was, "Mt. Hamilton is a good neighborhood and the Moores were good neighbors to all of us now present. We hope to look toward them as such even though they are no longer living on the mountain in their retirement."

And as a good neighbor gone I can only think of him now.

AAS TO MEET AT OTTAWA

The 81st meeting of the American Astronomical Society will be held in Ottawa, Ontario, Canada, on June 19-23, on the invitation of Dr. C. S. Beals, director of the Dominion Observatory. In addition to the usual sessions for papers, there will be a symposium on meteoric astronomy, and Dr. S. Chandrasekhar, of Yerkes Observatory, will give the third Russell lecture.

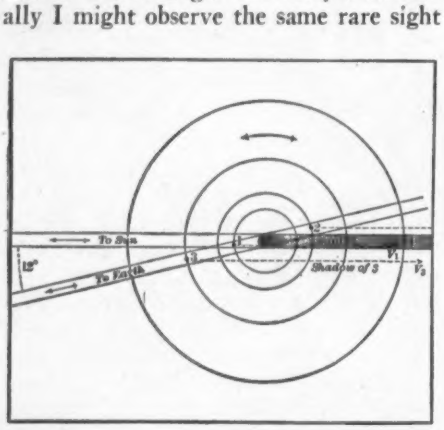
TERMINOLOGY TALKS.

J. Hugh Pruett

Star Inside Crescent Moon?

In pictures and on certain flags of Turkey and a few other countries a star is sometimes depicted as nestling too near the inside curve of the crescent moon. Such a sky picture, beautiful as it would be, is a natural impossibility. The old moon is actually "in the new moon's arms," a complete armful of lunar orb, and there is no empty sky space where earthshine holds sway. This picture would be possible only were any objects nearer than the moon. Venus, which comes closer to us than any other planet, is never nearer than about 100 times the moon's distance from us. Its light would have to shine through about 2,000 miles of solid moon to produce such a picture. However, a meteor coming straight toward an observer from the direction of the dark part of the moon could momentarily give this effect.

In response to a recent newspaper article of mine on this definitely impossible phenomenon, a reader wrote both to the editor and to me that she had several times seen a bright star inside the crescent and had heard of similar observations by others. She suggested that if I would get out early occasionally I might observe the same rare sight



When Jupiter is at quadrature with the sun the angle between sun and earth may be 12 degrees as seen from the planet. Phenomena of the satellites illustrated here are: 1, shadow transit; 2, occultation; 3, transit; 4, eclipse. Diagram from "Astronomy," by Russell, Dugan and Stewart.

"for it occurs only just before dawn." Transits of airplanes and birds over the moon are possible, of course, and I have observed with a telescope a distant flock of three or four dozen geese flying V-formation across the full moon.

Jovian Satellite Phenomena

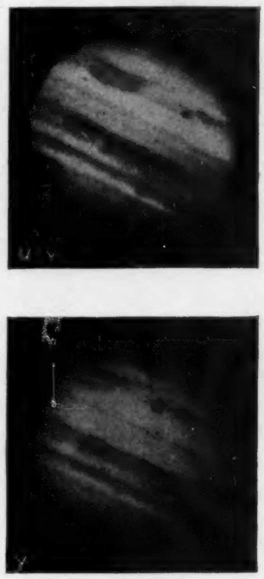
The owner of a good 3-inch refracting telescope is well equipped to obtain lifelong enjoyment from the study of the giant planet Jupiter and the largest four of its 11 moons. These four satellites, one about the size of our moon and the others somewhat larger, are near the limit of naked-eye visibility. Even small opera glasses will easily show them when they are not too close to the planet. The other seven satellites require big telescopes for their detection.

Jupiter is such a large body (mean diameter about 87,000 miles) that every time the moons numbered *I, II,* and *III* get on the side of the planet opposite that of the sun, they pass into the planet's shadow and are eclipsed. Satellite *IV* is so much farther from Jupiter that a good deal of the time it avoids becoming "blacked out." When we on the earth are almost between the sun and Jupiter, we cannot see into the shadow space, so we are not able to view the Jovian eclipses. But when relative positions are such that we obtain somewhat of a side view, we can observe either the beginning or ending of such an event and sometimes both in the cases of *IV* and *III,* and very rarely of *II.*

Even though the satellites appear quite starlike in small instruments, they have observable diameters and they fade for a short time before disappearing into Jupiter's shadow. Time is required also for the occultation of a satellite by the disk of Jupiter. The little dot of light just before it passes behind Jupiter appears for a short while to stick to the planetary rim, and then it is gone. The reappearance on the opposite side is equally intriguing, although often such reappearance is from out of the shadow and occurs a short distance away from the limb of the planet.

When a satellite passes between us and Jupiter, it seems to be moving across the face of the planet, but in the opposite direction of the motion of occultation. Since we see the lighted sides of both planet and moon during transits, it is very difficult to see the transiting satellite through a small telescope. But its shadow cast on Jupiter is black and

In these photographs of Jupiter, the upper in ultraviolet light, the lower in yellow light, the shadow of a satellite appears as a small black dot on the planet. Lick Observatory photographs.



usually appears at a different place on the planet's disk from that where the satellite itself is seen. On fine nights I have seen a satellite's shadow without much difficulty through a 3-inch refractor, but a 10-inch instrument is far better. The spot where the satellite's shadow falls on Jupiter marks a total eclipse of the sun going on for that spot at that time.

Essential to those who wish seriously to study the phenomena of Jupiter's satellites is the *American Ephemeris and Nautical Almanac,* for sale by the Superintendent of Documents, Washington 25, D.C. The 1949 edition is \$3.25, and the 1950 edition is \$3.50. The times of all eclipses, occultations, transits, and shadow transits for Jupiter's four bright satellites are given, and a considerable amount of other useful observing data concerning the Jovian system of moons. Beginning next month, when Jupiter is well placed in the sky in the late evening, the Observer's Page of *Sky and Telescope* will carry selected information for observations of the satellites.

Painting the Eclipse of the Moon

By Julian E. Garnsey

IN CO-OPERATION with astronomers at Princeton University Observatory, the writer, a colorist and portrait painter, recorded in full oil color his impressions of three stages in the total eclipse of the moon on the evening of April 12th. The three moments chosen for representation were 10:15 p.m. EST, when the moon was about four fifths covered by the earth's shadow; 10:25, just prior to total eclipse; and 11:11, mid-eclipse. Dr. Newton L. Pierce operated the Princeton 23-inch refractor.

To prepare for the fast action required in putting down color effects of short duration, five canvases were made ready upon which the principal fields of color difference — the lunar seas — were outlined from photographs. Colors, canvases, brushes, and other materials were laid out on a large table, placed to the left of the telescope's eyepiece. The light chosen for illuminating the palette and canvas was 3,500-degree fluorescent, since this was thought to be a fair compromise between incandescent and daylight, the two conditions under which the finished paintings would probably be viewed.

As the moment for the first painting approached, four methods were used to view the color effects: the unaided eye, 6-power binoculars, the 20-power finder, and the 23-inch telescope at 50 power. It was soon evident that a choice had to be made among the effects transmitted to the artist's mind by these methods, for each differed from the other. The eye alone gave the richest color reactions, and each increased magnification gave less marked color differences. In the great telescope, very little contrast was observed between the normal pale aquamarine of a fully illuminated moon and the warmer, more orange color of the advancing shadow, though this progressive difference was obvious to the unaided eye. It was therefore quickly decided that colors should be judged by eye alone and that the telescopes and binoculars should be used only to identify the markings on the moon.

Unfortunately, a slight haze reduced somewhat the effect of the first view painted, since it created a gray nimbus of dispersed light around the moon about four moon diameters across. Within this area, the shadowed side of the moon was hardly discernible from the surrounding halation, but the characteristic progression from the fully illuminated segment through pale clear green, then to pale pure blue, into warmer shadow, was plainly visible. In addition, it was noted that the outer edge of the nimbus became reddish-brown against the deep blue sky, an unexpected color.

For the second painting the intervening mists obligingly moved away, leaving the moon sharply outlined against the blackish blue sky. Now the artist had to work with all possible speed, for the effect to be recorded lasted only four or five minutes. At this point the shadowed side of the moon had become rich, dark orange, darkest near the center; the thin sliver of lighted surface was brilliant greenish white; between the two a pure light green transition in color was seen. This painting turned out to be the most dramatic of the three.

The final painting, showing the moon in total eclipse, was made at reduced speed, since ample time was available to study the grayed oranges and red-oranges which gave an effect of molten metal upon which the seas stood out in cooler, bluer contrast. As the intensity of the moon colors decreased, the sky seemed to lighten and become bluer. In consequence, for the one eclipse, the three paintings show three different sky colors according to the varying atmospheric conditions and to the familiar principle of vision, simultaneous contrast.

During the painting of the eclipse and afterward, the question was raised as to just how "true" the color impressions noted by the artist were. Some of those present wondered whether a truer, that is, more scientific record might have been obtained by color photography.

Different eyes see color differently, in view of the fact that some 20 per cent of American men have abnormal color vision to some degree. However, in color photography the three standard colors of superimposed film currently used establish one limitation, and the necessity for very exact length of exposure constitutes another.

A more important reason for preferring a painting to represent the eclipse as seen by a human observer is that certain peculiarities of human vision, not found in photography, had to be taken into account. For instance, a small colored object will appear differently to the eye depending upon the time-length of the observation, the contrast with the color of the background, and the relation in area between the object and the amount of background within the visual field. The painter's eye makes these adjustments automatically and delivers a synthesis of the color effects to his brain for transmission to the canvas.

Thus the best that can be said of the records painted of this eclipse is that they are the impressions of one pair of trained eyes, in a given state of health, for given periods of time. The same qualifications will hold true for any paintings of astronomical phenomena or, indeed, for any other subject whatever.

From the paintings made during the eclipse will be composed, under the more comfortable conditions of the studio and under no compulsion of time, larger canvases which will be presented to Princeton University.

Planetarium Notes

BALTIMORE: *Davis Planetarium.* Maryland Academy of Sciences, Enoch Pratt Library Building, 400 Cathedral St., Baltimore 1, Md., Mulberry 2370.

SCHEDULE: 4 p.m. Monday, Wednesday, and Friday; Thursday evenings, 7:45, 8:30, 9:30 p.m. Admission free. Spitz projector. Director, Paul S. Watson.

BUFFALO: *Buffalo Museum of Science Planetarium.* Humboldt Parkway, Buffalo, N. Y., GR-4100.

SCHEDULE: Sundays, 2:00 to 5:30 p.m. Admission free. Spitz projector. For special lectures address Elsworth Jaeger, director of education.

CHICAGO: *Adler Planetarium.* 900 E. Achsah Bond Drive, Chicago 5, Ill. Wabash 1428.

SCHEDULE: Mondays through Saturdays, 11 a.m. and 3 p.m.; Sundays, 2:30 and 3:30 p.m. Zeiss projector. Director, Wagner Schlesinger.

LOS ANGELES: *Griffith Observatory and Planetarium.* Griffith Park, P. O. Box 9787, Los Feliz Station, Los Angeles 27, Calif., Olympia 1191.

SCHEDULE: Wednesday and Thursday at 8:30 p.m.; Friday, Saturday, and Sunday at 3 and 8:30 p.m.; extra show on Sunday at 4:15 p.m. Zeiss projector. Director, Dinsmore Alter.

NEW YORK CITY: *Hayden Planetarium.* 81st St. and Central Park West, New York 24, N. Y., Endicott 2-8500.

SCHEDULE: Mondays through Fridays, 2, 3:30, and 8:30 p.m.; Saturdays, 11 a.m., 2, 3, 4, 5, and 8:30 p.m.; Sundays and holidays, 2, 3, 4, 5, and 8:30 p.m.; Wednesdays and Fridays, 11 a.m., for school groups. Zeiss projector. Curator, Gordon A. Atwater.

PHILADELPHIA: *Fels Planetarium.* Franklin Institute, 20th St. at Benjamin Franklin Parkway, Philadelphia 3, Pa., Locust 4-3600.

SCHEDULE: 3 and 8:30 p.m. daily except Mondays; also 2 p.m. on Saturdays, Sundays, and holidays; 11 a.m. Saturdays, Children's Hour (adults admitted). Zeiss projector. Director, I. M. Levitt.

PITTSBURGH: *Buhl Planetarium and Institute of Popular Science.* Federal and West Ohio Sts., Pittsburgh 12, Pa., Fairfax 4300.

SCHEDULE: Mondays through Saturdays, 2:15 and 8:30 p.m.; Sundays and holidays, 2:15, 3:15 and 8:30 p.m. Zeiss projector. Director, Arthur L. Draper.

SPRINGFIELD, MASS.: *Seymour Planetarium.* Museum of Natural History, Springfield 5, Mass.

SCHEDULE: Tuesdays, Thursdays, and Saturdays at 3 p.m.; Tuesday evenings at 8 p.m.; special star stories for children on Saturdays at 2 p.m. (Closed July to mid-September.) Admission free. Korkosz projector. Director, Frank D. Korkosz.

STAMFORD: *Stamford Museum Planetarium.* Courtland Park, Stamford, Conn.

SCHEDULE: Tuesday and Sunday, 4 p.m. Special showings by request. Admission free. Spitz projector. Director, Ernest T. Ludhe.

Harvard's 16-inch Metcalf doublet was stopped down for the partial phase series: to three inches for the first five exposures, four inches for the next five (right to left on bottom row), and six inches for the two before totality. Full aperture was used during totality for a three-minute exposure (lower left), 11:24-11:27 p.m. EST. Photo by William Liller.

A Somewhat Dark Eclipse

MOST of the United States appears to have had favorable weather for observing the total lunar eclipse on the evening of April 12th. Among the many excellent pictures that have been received, a few indicate that this was by no means a "black eclipse," as had been reported in some of the press accounts following the event itself. In this connection, the 1926 edition of **A New Astronomy**, by David Todd, page 307, states:

"There are all variations of the moon's visibility when totally eclipsed; in 1848, so bright was it that some doubted whether there really was an eclipse; while in 1884 the coppery disk of the moon disappeared so completely that she could scarcely be seen with the telescope."

Alameda, Calif.: While observing the eclipse, Frank R. Burns and his daughter noted an occultation of the star 76 Virginis (**h** Virginis), magnitude 5.4, taking place. This was omitted from the Observer's Page list because the moon was full and the star below the limit of magnitude of 5.0, but the occultation should have been especially mentioned as being visible during eclipse to observers in the central and western United States.

Rochester, N. Y.: Mrs. Ralph Dakin, secretary of the Astronomy Section of the Rochester Academy of Science, describes the "three-star" treat the amateur astronomers of Rochester had that evening. At 8:00 p.m. Sir Harold Spencer Jones, the Astronomer Royal of England, gave a talk before a joint meeting of several local groups in which he discussed chiefly the abundances of the elements in the stars. Then the eclipse was observed, "the moon easily visible until totality was nearly over, when heavy clouds obscured the disk and the stars. The moon was darker than in the usual lunar eclipse, but it could not be called a truly 'black' eclipse." At 11:20 p.m. EST a fairly bright aurora was seen. The white and pale green streamers rose from the horizon about 50 degrees. By 11:50 all traces of aurora had disappeared. Photographs of two stages of the eclipse were sent, taken by Paul W. Davis at the prime focus of his 5-inch Clark refractor.

St. Louis, Mo.: Newspaper accounts indicate that the eclipse was seen under ideal weather conditions.

San Francisco, Calif.: Lewis Lindsay reports that the moon rose over the bay region in partial eclipse above low-lying haze and clouds. He was observing on Mt. Tamalpias about 12 miles northwest of San Francisco at an elevation of 2,600 feet. Approximately 25 miles southeastward from the mountain Mildred Butler took observations at sea level near the base of the Burlingame hills. Notwithstanding the difference in altitude, both results were substantially the same: the moon shone dark and dull and wholly without colors throughout the full period of eclipse. The timing and movement of the deeper shadows across the lunar face showed general similarity for both stations.

Jefferson City, Mo.: Via Mr. Lindsay, we learn that Gene Waters observed colors ranging in order from a reddish cast to a shade of blue, a greenish cast, dark orange and light orange — with the greenish cast at the top of the disk at 9:47 CST.

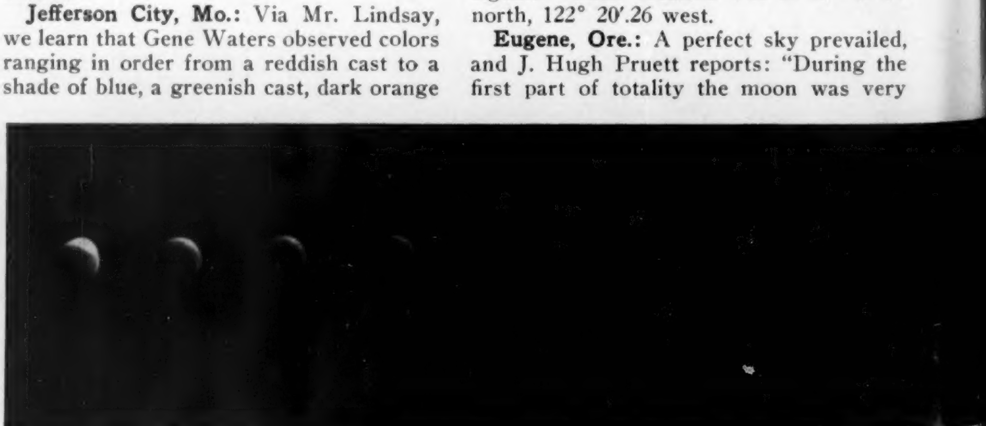
Massena, N. Y.: A report from Karl A. Wells, sent also by Mr. Lindsay, noted casts of purple, gray, reddish brown, and a pale blue which turned green when northern lights were displayed at 11:18 p.m. EST. When the aurora faded, the eastern half of the disk returned from green to pale blue, fading to gray at the edge of the shadow.

Waltham, Mass.: A series of pictures of the partial phases, showing Spica on each exposure, was sent by Roland A. Jeannotte.

Vicksburg, Miss.: "Lucky you (all)!" writes Mrs. Albert M. Bonelli. "Not once did the moon break through the clouds, although I prayed hard and loud."

San Pablo, Calif.: Glen F. Bailey and Horace K. Burr, with a 2-inch refractor and a 6-inch reflector, timed the occultation of 76 Virginis at 5:08:00 and 5:08:01 (UT), respectively, employing WWV time signals. Their location was at 37° 57'.79 north, 122° 20'.26 west.

Eugene, Ore.: A perfect sky prevailed, and J. Hugh Pruett reports: "During the first part of totality the moon was very



This series begins at left three minutes before totality and ends at right one minute after t

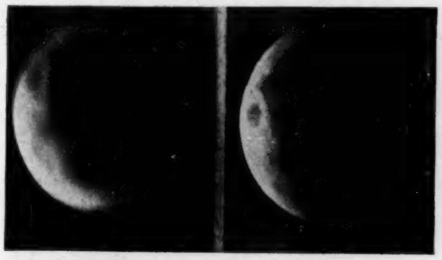
dark but it was not by any means a complete blackout as reported this morning from the Hayden Planetarium. During the last half of the total phase, there was a great deal of light on the moon. We could easily tell where the moon was during all of totality. At Portland it was cloudy for most of the eclipse, and at Spokane it was also cloudy."

Oceanside, N. Y.: A high cloud layer and haze obscured but did not hide the lunar eclipse on Long Island, according to Peter Leavens. Totality was always discernible to the naked eye, although admittedly dark.

Osborne, Kan.: Northern lights were seen by students at the high school during the eclipse. Several streaks were observed two to four degrees wide and 35 degrees high, the display beginning at 9:54 p.m. CST, and lasting about 18 minutes. The high school, reports Robert R. Brownlee, has made an hour available each day to four students to study astronomy. They have purchased a Skyscope, and one student is now polishing his first 6-inch mirror.

Kenmore, N. Y.: Walter J. Semerau sent a large number of 8 x 10 enlargements of the partial phases taken with his 6-inch reflector (see page 204). One picture of totality was included, and is reproduced here.

San Juan, Puerto Rico: Carlos E. Seijo transmitted photographs of the eclipse taken by F. de P. Circuns, including the one of totality shown here which recorded the entire disk of the moon.



Mid-totality, and the partial phase (right), photographed by F. de P. Circuns. Courtesy, "El Imparcial."

Detroit, Mich.: Dr. E. R. Phelps and Mr. Esling, physics and astronomy department, Wayne University, worked with Station WWJ-TV in televising the lunar eclipse. Images of the moon on television sets were produced by two methods. One was by the simple use of a telephoto lens on the television camera, to give a fairly bright image of the moon that filled about one fifth of the viewing screen. In the second method, a 6-inch reflector and eyepiece were used to project an enlarged image; the television camera was placed with its lens close to the racked-out eyepiece to give an image of the moon which nearly filled the viewing screen.

The television program was on the air during the hour of partial phase, until 10:30 p.m. EST, by which time totality rendered the moon no longer visible by television. It happened that a tower with an illuminated clock was visible from the roof where the television cameras were located. One operator superimposed the clock in the lower right-hand corner of the screen to time the progress of the eclipse.

Omaha, Neb.: At five-minute intervals beginning at 7:45 p.m. CST, and ending at midnight, Doneley H. Watson photographed the eclipse, procuring 52 images on three pictures by spacing them across the diagonal of the frame. His second series included totality, and 19 of its images are reproduced here. Each exposure was one half a second at f/5.6, with a 2¼ x 3¼ Kodak Monitor, four-inch focal length. The film was Super XX developed in Microdol.

New York, N. Y.: Observers in the metropolitan area were rather disappointed by haze and high cirrus clouds. The penumbra was first observed with the unaided eye by Edward Oravec 20 minutes before the moon's contact with the umbra. During totality colors seen were gray, blue, white, and a pale red. Only Mare Crisium could be discerned throughout the total phase. Mr. Oravec notes that this was far from a record dark eclipse. On May 18, 1761, the eclipsed moon completely vanished from telescopic view. Eight telescopes of the Optical Division of the Amateur Astronomers Association were set up for public observing outside the Hayden Planetarium.

Saco, Me.: Francis D. Chapin, who also sent pictures showing the moon during totality, writes: "The eclipse was total here only in respect to the passage of the earth's shadow. The moon was so bright during total eclipse that at least one person looked at it and did not realize that the eclipse was in progress. The sky was clear throughout the total phase and earlier. The northern lights started about 10:30 EST and were still going at 12:30 a.m.

"The most noticeable thing to me was the absence of any sharp marking to determine exact times or positions. During totality, on the bright northeast limb the light was always more whitish than red, while on the southwest limb the red was so deep that it showed brighter through a deep red filter."

A 10-second exposure 17 minutes after totality began, with an f/8 6-inch reflector. Photo by Walter J. Semerau.

Washington, D. C.: The National Capital Astronomers were completely clouded out.

Great Neck, N. Y.: "During totality the moon was much darker than I had been led to expect," writes Alan C. Merson. "Earlier that evening it had been intermittently cloudy, but luckily it became quite clear during the entrance of the moon into the umbra. From about 9:45 p.m. EST, Spica was visible without optical aid, and for a long time after totality began the northwest section of the moon was still fairly well illuminated with white light. However, the haze again increased, and as a result only 1st-magnitude stars were visible, and the moon blackened considerably."

Boston, Mass.: During totality, with the moon readily discernible at the eclipse party on Boston Common, the 5th-magnitude stars in the Little Dipper could be seen. The difference in brightness between the bright and dark portions of the moon during totality was very conspicuous — perhaps the darkness of the eclipse was chiefly an effect of a dark center with less red light than usual contrasting with bright outer regions of the umbra. At Harvard's Oak Ridge station at Harvard, Mass., a series of photographs of the partial phases was taken by William Liller, those before totality being reproduced on the opposite page.

Sacramento, Calif.: Sacramento Valley Astronomical Society members photographed the eclipse with a 12½-inch reflector and accommodated the public with three portable telescopes. The SVAS **News** states that the eclipse was unusually dark.

e after t ty ended. The image of Spica appears along the bottom. Photo by Doneley H. Watson.

BOOKS AND THE SKY

WEATHER ELEMENTS

Thomas A. Blair. Prentice-Hall, New York, 1948. 373 pages. $5.65.

THE THIRD EDITION of Blair's well-known text, originally published in 1937, appears in a new format that illustrates the problems of textbook publishers these days. Though containing many additional pages, the book is smaller and thinner than previous editions. Economy forced the use of a poorer quality of paper, yet the cost of the book, of necessity, is higher than the 1942 edition.

The most significant additions are those dealing with the characteristics of air masses and the dynamics of fronts — the Norwegian polar front theory and air mass analysis system. It is a sad and significant commentary on American meteorology that the 1937 edition made no mention of and the 1942 edition devoted only a brief mention to forecasting methods that already had been accepted and employed by European weather services.

Other recent developments discussed in the present edition for the first time are the methods employed in preparing extended forecasts by the use of weather types, of extrapolation, and of five-day means — methods currently employed by the extended forecast section of the U. S. Weather Bureau. In other chapters the discussions of circulation zones and cells, and of fogs, thunderstorms, and instability, have been revised and expanded.

Of greatest interest to the amateur observer are the pages devoted to instruments. All the standard Weather Bureau instruments are described, and mention is made of several new wartime improvements. It is good to see an illustration of the new Aerovane system that employs the propeller-type anemometer for the first time in an instrument commercially available. Attention is also given to the use of radar and sferics techniques in storm detection. In this and all other texts that the reviewer has seen the all-important radiosonde for upper air soundings of temperature, humidity, and pressure, has been neglected. This tool of the modern forecaster seldom gets more than a picture and a passing mention, yet it is the key to all our knowledge of the meteorology of the upper air. Thus, most students are unaware of the fundamental design and operating principles of the radiosonde which supplies most of the basic data for modern aviation forecasting.

The chief defect of the volume, and it is a very serious one for a textbook, is the poor quality of the photographic reproductions. This is most evident on pages 212-213 where a tornado is depicted, but it is almost impossible to distinguish the funnel of the tornado in the blur of the print. The cloud pictures, too, are of such poor quality that they might just as well have been left out.

Teachers and students will welcome the fine bibliography that is broken down into classified sections. Here mention is made of many wartime publications that will assist in bringing the weather follower up to date in his knowledge.

The book retains its general character as an introduction to the science of meteorology without resort to technical, mathematical physics. It is recommended to all who wish to cut their first teeth in meteorology.

DAVID M. LUDLUM
Amateur Weathermen of America
Franklin Institute

ENGINEERING THE NEW AGE

John J. O'Neill. Ives Washburn, Inc., New York, 1949. 320 pages. $3.50.

THAT a new age for mankind is coming is hardly a matter for debate, different though opinions may be as to its nature and the time schedule. This book presents the ideas of one well-qualified observer as to what it may be and how it can be brought about.

"If we are going to do an engineering job on building a new age and a new world," writes Mr. O'Neill, who has been science editor of the New York **Herald Tribune** since 1932, "it would be well to get firmly fixed in our minds the idea that it is a big one, and it will be necessary to proceed in the way an engineer would — by getting thoroughly acquainted with the site on which the construction work will be done, and with conditions in the neighborhood which will influence the planning, the building operations and the use of the completed structure. The site upon which we are going to build

SKY-GAZERS EXCHANGE

Classified advertisements for this column are 8 cents a word, including address; minimum ad 20 words. Remittance must accompany orders. Write Ad Dept., Sky and Telescope, Harvard College Observatory, Cambridge 38, Mass.

TELESCOPES & ACCESSORIES: If you want good optics and accessories for your astronomical studies, send for our catalogue. We will also submit prices on photometers and associated equipment for stellar photometry. Laboratory Optical Co., 76 Interhaven Ave., Plainfield, N. J.

FOR SALE: 6" (145-mm. clear aperture) refracting telescope. Bausch and Lomb precision equatorial mount. Steel pier, clock drive, setting circles, slow motions both axes, universal adjustments. Objective, of 50" focal length, is a doublet apochromat made on an air-spaced design from special glasses. Clear crisp planetary images without color borders. Three orthoscopic eyepieces and achromatic Barlow lens give powers from 40x to 280x. Finder. Star diagonal. $895.00. Photo on request. A. E. Gee, 129 Seminole Way, Rochester, N. Y.

FOR SALE: 3" Ross refractor, four eyepieces, variable density filter, and tripod. Price $60.00. Also 10 to 40 variable power telescope. Price $25.00. Herbert Schulze, Lyons, Nebr.

WANTED: 6" or larger reflecting telescope in good condition and very reasonably priced. Send description to Roger Snipes, 303 Stonewall, Rock Hill, S. C.

BUSCH BINOCULAR, pill box, coated optics, 80-mm. objective, 10x magnification. Mounted on sturdy adjustable tripod. Fine for observation and spotting purposes. Value $400.00 new, reconditioned price $250.00 complete. Send for our 8-page list of camera and projector bargains. All leading makes. Paul L. Brand & Son, 2153 K St. N. W., Washington 7, D. C.

BARLOW LENS to thrill you! Doubles your scope's versatilities by lengthening at will your focal length any variable amount practical for your aperture regardless if from 3" to 36". Not only increases magnification of all eyepieces from greater f.l. but positively betters definitions as natural to longer focal lengths, assuming good figure. Can use highest powers on larger eye-end openings of lower power eyepieces, and by longer f.l. better definition on ¼" or shorter eyepieces. Fits with applicator tube in standard 1¼" eyepiece holders of both reflectors and refractors. Barlow is coated, brand new, in fine cell, achromatic and of finest astronomical accuracy. Unlike a Cassegrainian secondary which must be figured to focal length, a true Barlow gives equally sharp definitions on all f.l. from f/4 to f/30 of primaries, despite general assumptions to the contrary by those who do not know the actual optical practicability of a true Barlow over an ordinary negative lens. Users report seeing things never seen before with their scopes, such as planetary detail, close doubles well separated, Encke's division of Saturn's ring, etc. The most experienced, including professionals, thrill at this new first-time experience with this Barlow. For enlightening information free, send stamped addressed return envelope, but to avoid chances of limited supply quickly gone, send $17.50 for Barlow, applicator tube, directions and information, postpaid, on agreement of full refund if after a week's trial you are not delighted, providing returned postpaid within 10 days in same unscratched good condition as received. F. L. Goodwin, 345 Belden Ave., Chicago 14, Ill.

EVERYTHING in telescopes . . . from fine 4" completely equipped to inexpensive hand scopes suitable for the youngsters to experiment with. Lists free. Rasmussen & Reece, Amsterdam, N. Y.

MUST SELL 6" reflecting telescope, focal length 56". Mirror optically perfect. What am I offered? Ben Cohen, 1008-44 St., Brooklyn 19, N. Y.

FOR SALE: Mounted 4", 5", and 6" refractor objectives of first quality. $100.00, $200.00, and $300.00. Correspondence invited. Earl C. Witherspoon, Sumter, S. C.

LUNASCOPE: plastic 2¼" long, built-in transparency, craters well defined. Amusing, instructive. 50 cents each. Valley View Observatory, Pittsburgh 14, Pa.

LABCOTE: Lens coating for your telescopes, binoculars, cameras, etc. LABFLECT: Fluoride protected aluminizing. 6" mirrors, $3.50; 8", $4.50 FOB. Eyepieces for sale: Kellner wide field, achromatic, coated, 1 1/16" E.F.L., 1¼" diameter, $5.00. Price list and information on request. H. Leroy Benfer, Box 5160, Washington 19, D. C.

is the earth and its neighborhood is the universe. It is, perhaps, of even greater importance to the engineer to ascertain something about the people he is dealing with. The people, in this case, will comprise the human race . . . ."

Developing this thesis, he proceeds with a critical examination of our present civilization and its development. He shows how a number of man's so-called inventions were anticipated in nature, and how even many of our modern scientific concepts were paralleled in ancient myths.

Although, "as a symbol of engineering skill," he terms the skyscraper "a monument of overpowering grandeur, magnificent in conception and construction, emblematic of both stark reality and soaring phantasy, with roots in the earth and head in the sky," he finds that our cities are "aggregates of gross and gaudy gadgetry supercharged with the viruses of rapid decay which will require their quick abandonment and the creation of a new constellation of cities built on a better idea and more in keeping with the spirit of the new age."

Since no one individual can exhibit the aggregation of knowledge and wisdom that will be needed to engineer this new age, Mr. O'Neill foresees a solution in the creation of the "multiman," which will do "with the individual man what nature did with the single cell organism — organize a number of them into a cooperative individual . . . .

"The super-engineer of the future may have to be such a multiman, a many-sided group covering all the physical and social sciences, which will bring all its combined knowledge to the solution of all aspects of engineering projects, including the social and economic effects of technology."

JAMES STOKLEY
General Electric Company

CORRECTION TO THE ATLAS OF THE HEAVENS

On Chart VII of the Skalnate Pleso **Atlas of the Heavens** you will find that the nebula H V 30, NGC 1977 Orionis has been mistitled NGC "1982, M43." The latter is a small circular wisp of nebulosity surrounding an 8th-magnitude star north-following the Trapezium of the great Orion nebula (M42). It is set off from the nebula by the "fishmouth," a dark rift which is slightly luminous. Visually, it is a separate nebula, but in long-exposure photographs the "fishmouth" fills in. The outline of the Great Nebula in the **Atlas** suggests that it was from such a photograph that the nebula was drawn. NGC 1977, the back-cover illustration of the March, 1949, **Sky and Telescope,** is north of the Great Nebula and is, according to Deep-Sky Wonders for February, 1943, a "fan of six stars in gauze." The object marked as M43 in the **Atlas** contains five stars there, and is at the 1950 position of NGC 1977 ($5^h\ 33^m.0$, $-4°\ 57'$).

This error is by no means a discredit to Becvar's fine work. It would be folly to presume that such a large compilation is free from errors. I extend my congratulations to the author for this splendid atlas.

ARCHIE D. WILLIAMS
2501 Haste St.
Berkeley 4, Calif.

GLEANINGS FOR ATM's

A Mounting for Telescope and Camera

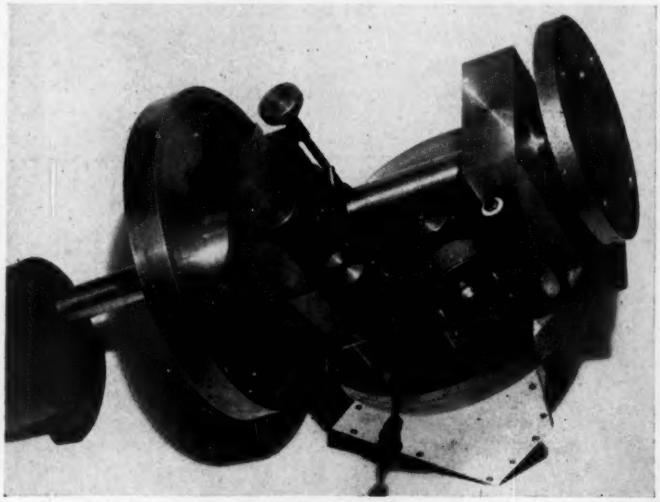
WALTER J. SEMERAU, 135 Zimmerman Blvd., Kenmore 17, N. Y., is a very enterprising amateur telescope maker and photographer. His equipment includes a 6-inch f/8 reflector, an Army K-19 aerial camera converted for celestial use, and a clock-driven mounting on which either instrument may be operated. He has sent us photographs of the moon and of its recent eclipse, including one of the total phase reproduced on page 201.

He made his own castings for the mounting from scrap duraluminum cast in river sand molds made from orange crates. The polar axis bearings are 5½-inch ball bearings; the declination axis runs on heavy-duty truck ball bearings, and operates through a friction clutch and worm gear. The right ascension circle is graduated to 4-minute divisions, declination circle to 1-degree intervals.

The mounting is driven by a Telechron clock motor (6-watt) through a gear train made up of parts removed from German airplanes.

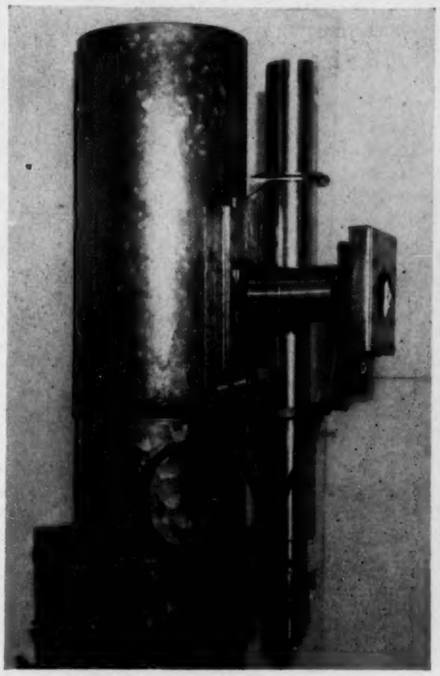
The galvanized sheet-metal tube is lined with ¼-inch felt. The tube saddle fits on the telescope by the same method as an auto wheel fits to its axle. The photographic eyepiece is operated by rack and pinion; visually a focusing eyepiece is employed. The guide telescope is of scrap duraluminum, equipped with a war surplus lens of 23½ inches focus and illuminated crosshairs. The power of this finder may be varied from 12x to 36x depending on the eyepiece used.

In addition to his lunar photographs



A closeup of Walter Semerau's mounting showing details of the clock motor drive and circles.

Walter J. Semerau observing with his 6-inch f/8 reflecting telescope.



The upper portion of the tube of the 6-inch reflector, showing the plate-holding attachment and the new variable-power finder.

with the reflector, Mr. Semerau has taken excellent guided pictures with the aerial camera of such subjects as Orion and the clusters in Taurus (see page 207). The accompanying photographs of his equipment were made by him with an unusual press camera that he also built himself. As a result of his hobby activities, he is now employed by Linde Air Products research laboratories as an instrument maker.

The K-19 aerial camera fits on the same mounting as the reflector. Note the long-focus guide telescope, an essential to good celestial photography.

LUNAR CRATER PORTER

It is reported in **The Strolling Astronomer** that selenologist H. Percy Wilkins, director of the lunar section of the British Astronomical Association and compiler of a 300-inch map of the moon, has tentatively named for the late Russell W. Porter a crater on the moon formerly known as Clavius B. This crater is situated on the north wall of the great ring plain of Clavius and is about 25 miles in diameter. It has a central peak and a curved ridge within it and is equally conspicuous with Rutherfurd, a similar crater in Clavius' south wall, formerly known as Clavius A.

The proposal to name a lunar crater for Dr. Porter was set in motion by David P. Barcroft, of Madera, Calif., and Albert G. Ingalls, editor of the Amateur Astronomer section of **Scientific American.**

The Strolling Astronomer points out that on June 4th and July 4th, near first-quarter moon, the new crater which may be officially named for Porter will be finely displayed near the moon's terminator. Telescopically, Clavius is high on the moon south of Tycho; it may be identified on the back cover of **Sky and Telescope** for January, 1947.

FIREBALL NOTE — APRIL 11TH

The lunar eclipse of April 12th was preceded by an extraordinarily bright meteor which, appearing about 7:25 p.m. EST on the previous evening, aroused almost as much newspaper and public interest in New England as the eclipse itself.

Reports on this fireball were received from Maine to Delaware, and as far inland as central Vermont and west-central New York. In the hope that the end of its flight might have been over land and that there might be meteoritic fragments, a rough analysis of the data on hand was undertaken. This only verified the previous estimates that had placed the entire path of the fireball well out to sea. From reports received at Harvard, it appears that the fireball had a very flat trajectory, keeping it visible even to distant observers for many seconds. During this stage its color was a brilliant green. Moving from northeast to southwest, roughly parallel with the coast, the meteor exploded at a height of some 25 or more miles while still 100 miles east of Newport, R. I. The fragments from the explosion varied in color from yellowish through red, and included several main bodies whose paths diverged quite noticeably. These appeared to fall more rapidly, and in any event they must have ended in the ocean.

HARLAN J. SMITH
Harvard College Observatory

MOON PHASES AND DISTANCE

First quarter	June 4, 3:27
Full moon	June 10, 21:45
Last quarter	June 18, 12:29
New moon	June 26, 10:02
First quarter	July 3, 8:08

	June	Distance	Diameter
Perigee	7^d 7^h	228,100 miles	32′ 33″
Apogee	19^d 8^h	251,100 miles	29′ 34″
	July		
Perigee	2^d 22^h	229,800 miles	32′ 19″

OBSERVER'S PAGE

Universal time is used unless otherwise noted.

OPPOSITION OF VESTA

Vesta this month will be almost as close to the earth as it can ever get, and its opposition magnitude is given as 6.0. I have read that the ancient Chinese knew this asteroid as a naked-eye object; I have not succeeded in seeing it naked eye, but never had such a favorable opportunity as now. Opposition occurs on June 13th, at a distance of about 31 million miles. The following ephemeris is from the Cincinnati Observatory, 1950 co-ordinates:

Date	R. A.	Dec.
May 28	$17^h\ 49^m.2$	$-17°\ 36'$
June 5	17 38.1	−17 50
13	17 26.0	−18 05
21	17 13.9	−18 22
29	17 02.7	−18 41
July 7	16 53.3	−19 02

When retrograding near opposition, the asteroid should move about 21′ 39″ daily, or about 54″ hourly, counting both right ascension and declination. This means that once Vesta is located there should be little difficulty in following it, even without graduated circles. Dr. C. M. Huffer, of Washburn Observatory, points out that for observers at this latitude the low altitude of Vesta when on the meridian would cause its theoretical brightness of 6.0 to be observed as about 6.4. Observers in the deep South and West have, therefore, the most favorable conditions for naked-eye observation.

On June 21st Vesta will pass almost halfway between Eta Ophiuchi and Xi Ophiuchi. Its path throughout June will parallel a line joining Xi Serpentis and Eta Ophiuchi and nearly three degrees south of that line. On June 14th, the asteroid will pass about a quarter of a degree north of 192 B Ophiuchi, a star of magnitude 6.29, and on June 30th it will be very close to 29 Ophiuchi, magnitude 6.37.

HERBERT W. CORNELL
Assistant secretary
Milwaukee Astronomical Society

VARIABLE STAR MAXIMA

June 1, R Octantis, 7.9, 0556**86**; 3, R Canum Venaticorum, 7.7, 134440a; 6, R Reticuli, 7.7, 0432**63**; 9, S Herculis, 7.6, 164715; 14, R Ophiuchi, 7.6, 1702**15**; 16, RR Sagittarii, 6.6, 1949**29**; 28, R Aurigae, 7.8, 050953. July 1, R Serpentis, 6.8, 154615.

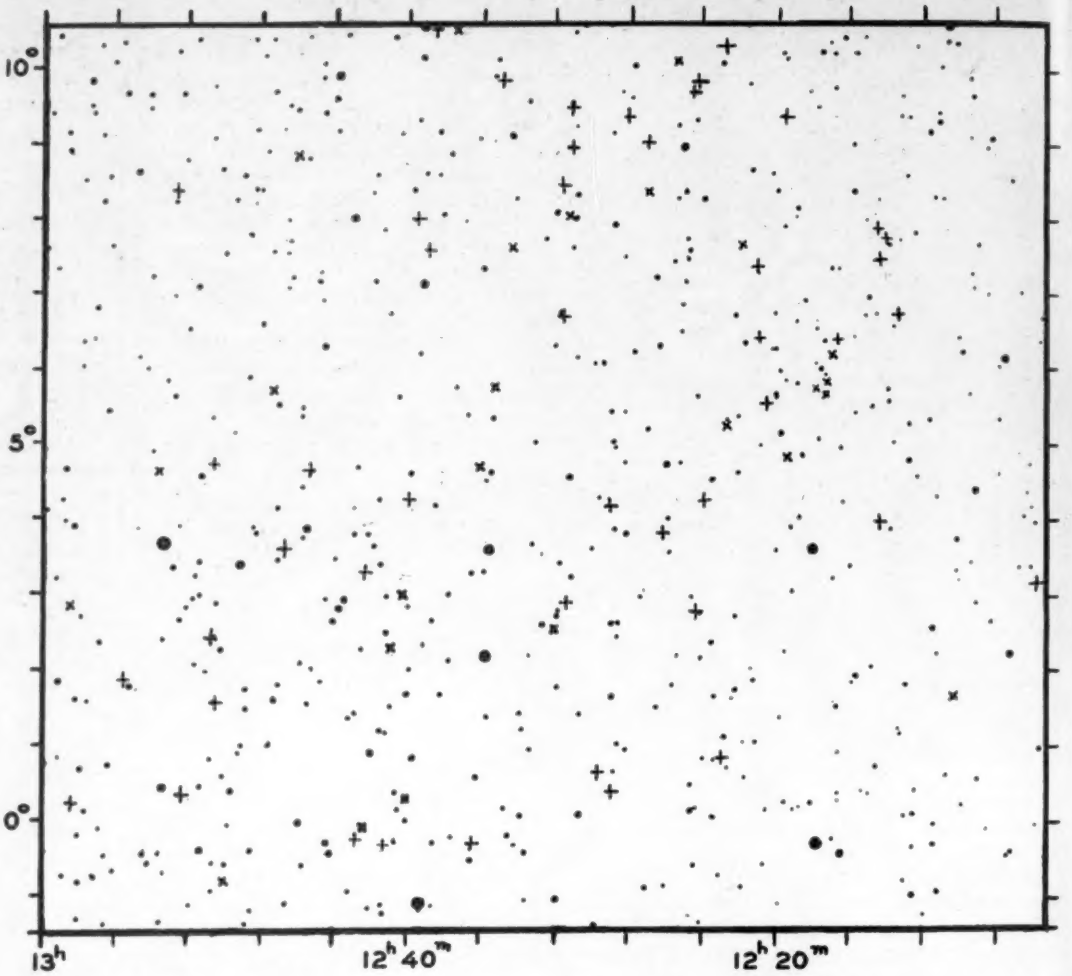
These predictions of variable star maxima are made by Leon Campbell, recorder of the AAVSO, Harvard College Observatory, Cambridge 38, Mass. Serious-minded observers interested in making regular telescopic observations of variable stars may write to Mr. Campbell for further information.

Only stars are included here whose mean maximum magnitudes, as recently deduced from a discussion of nearly 400 long-period variables, are brighter than magnitude 8.0. Some of these stars, but not all of them, are nearly as bright as maximum two or three weeks before and after the dates for maximum. The data given include, in order, the day of the month near which the maximum should occur, the star name, the predicted magnitude, and the star designation number, which gives the rough right ascension (first four figures) and declination (bold face if southern).

With a K-19 aerial camera mounted as shown on page 205, Walter J. Semerau photographed the Hyades and the Pleiades, 10-minute exposure at f/3.5 on Eastman Tri-X film, developed four minutes at 18° C. in Dektol, on Azo No. 3 paper. This is a contact print of a part of the original 8-by-10 negative.

DEEP-SKY WONDERS

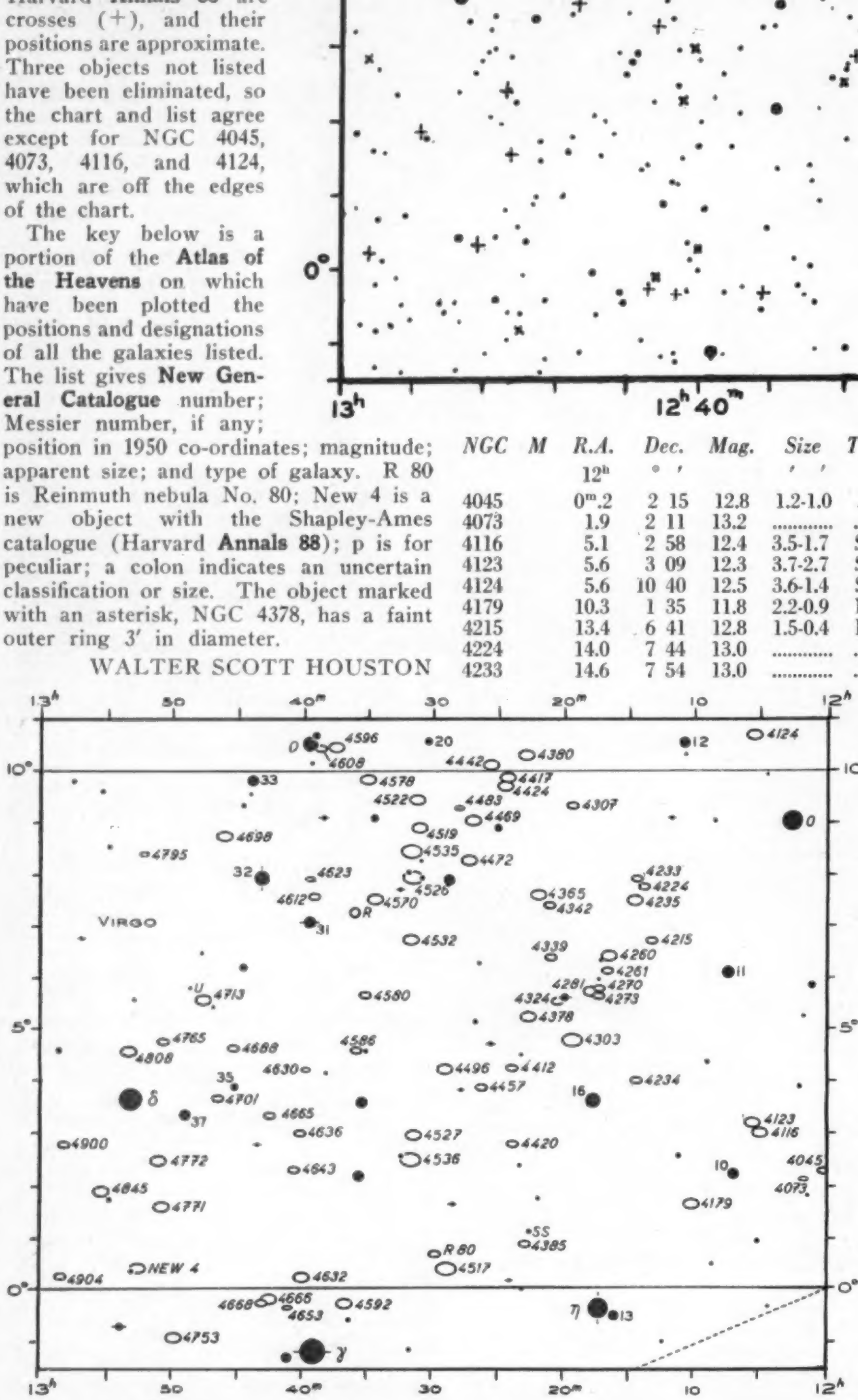
CONTINUING coverage of the Coma-Virgo region of galaxies, the charts on this page provide some overlap with those of last month, and a few galaxies therefore appear in both lists. The chart at the right is to a scale of one centimeter to each degree; star dots are by magnitude intervals; limiting magnitude is 9; north is at top of the chart. Coordinates are for 1950. Originally plotted objects in the Beyer-Graff chart are X's; those added to complete the listing from Harvard **Annals 88** are crosses (+), and their positions are approximate. Three objects not listed have been eliminated, so the chart and list agree except for NGC 4045, 4073, 4116, and 4124, which are off the edges of the chart.

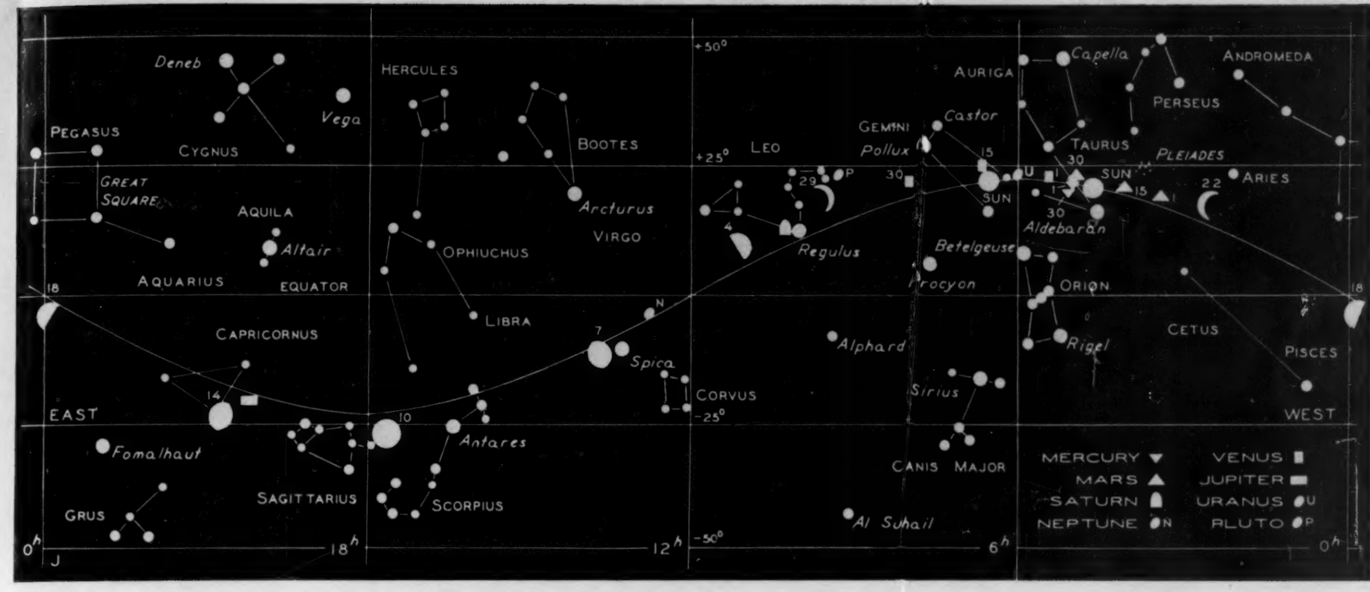


The key below is a portion of the **Atlas of the Heavens** on which have been plotted the positions and designations of all the galaxies listed. The list gives **New General Catalogue** number; Messier number, if any; position in 1950 co-ordinates; magnitude; apparent size; and type of galaxy. R 80 is Reinmuth nebula No. 80; New 4 is a new object with the Shapley-Ames catalogue (Harvard **Annals 88**); p is for peculiar; a colon indicates an uncertain classification or size. The object marked with an asterisk, NGC 4378, has a faint outer ring 3′ in diameter.

WALTER SCOTT HOUSTON

NGC	*M*	*R.A.*	*Dec.*	*Mag.*	*Size*	*Type*
		12h	° ′		′ ′	
4045		0m.2	2 15	12.8	1.2-1.0	....
4073		1.9	2 11	13.2	....	....
4116		5.1	2 58	12.4	3.5-1.7	S
4123		5.6	3 09	12.3	3.7-2.7	S
4124		5.6	10 40	12.5	3.6-1.4	S
4179		10.3	1 35	11.8	2.2-0.9	E
4215		13.4	6 41	12.8	1.5-0.4	E:
4224		14.0	7 44	13.0	....	....
4233		14.6	7 54	13.0	....	....
4234		14.6	3 58	13.0	....	....
4235		14.6	7 28	12.8	4.1-0.8	S:
4260		16.8	6 23	12.7	2.6-1.0	S
4261		16.8	6 06	11.7	1.6-1.3	E
4270		17.3	5 44	12.8	1.6-0.6	E
4273		17.4	5 37	12.2	2.0-1.4	Sb
4281		17.8	5 40	12.2	2.4-1.2	Sa
4303	61	19.4	4 45	10.4	6.0-6.0	SBc
4307		19.5	9 20	13.0	....	....
4324		20.6	5 31	12.5	1.9-0.8	S:
4339		21.0	6 22	12.6	1.5-1.5	E
4342		21.1	7 22	12.8	0.9-0.5	E:
4365		22.0	7 36	11.0	4.0-3.0	E
4378		22.8	5 12	12.8	3.0-2.7	E*
4380		22.9	10 17	12.8	3.3-2.0	S
4385		23.1	0 50	12.9	1.4-0.7	S:
4412		24.0	4 14	12.8	1.2-0.9	S
4417		24.3	9 52	12.3	2.7-1.1	E:
4420		24.4	2 46	12.5	1.7-0.7	S
4424		24.6	9 42	12.6	2.7-1.6	S:
4442		25.6	10 05	11.4	3.2-1.0	SBa
4457		26.4	3 51	11.7	1.8-1.4	S:
4469		27.0	9 02	12.5	3.3-1.0	S
4472	49	27.3	8 16	10.1	4.5-4.0	E
4483		28.2	9 17	13.3	....	....
4517		29.0	0 21	11.6	10.0-1.0	Sc
4496		29.1	4 12	12.0	3.0-2.0	S
R 80		29.9	0 38	13.0	....	....
4519		31.0	8 56	12.6	3.0-2.0	S
4522		31.2	9 27	12.9	3.5-1.0	S
4526		31.6	7 58	10.7	6.0-1.2	Sa
4527		31.6	2 56	11.3	5.0-1.2	S
4532		31.8	6 44	12.1	2.5-1.0	I
4535		31.8	8 28	11.1	6.4-5.0	S
4536		31.9	2 28	11.2	7.0-1.8	Sc
4570		34.4	7 31	12.0	3.0-1.0	E
4578		35.0	9 50	12.5	2.5-1.5	E
4580		35.3	5 38	12.8	1.5-1.2	Sc
4586		35.9	4 35	13.0	....	....
4592		36.7	—0 16	12.4	3.4-0.6	S:
4596		37.4	10 27	12.2	2.4-0.9	SBa
4608		38.7	10 26	12.7	2.0-1.5	S
4612		39.0	7 35	12.6:	1.1-1.1	E:
4623		39.6	7 56	13.2	....	....
4630		40.0	4 14	13.1	....	....





THE SUN, MOON, AND PLANETS THIS MONTH

The sun, on the ecliptic, is shown for the beginning and end of the month. The moon's symbols give its phase roughly, with the date marked alongside. Each planet is located for the middle of the month and for other dates shown.

Mercury enters the morning sky on June 3rd, passing inferior conjunction with the sun. Greatest western elongation occurs on June 28th, 22° from the sun. The elusive planet then rises about an hour before sunrise.

Venus may be viewed shortly after sunset low in the northwest sky, and may be followed for an hour. The magnitude is —3.3. The planet is 20° in longitude east of the sun at the end of the month, and forms a straight line with Pollux and Castor. On June 27th about 19^h UT, one may search in the daytime sky for the one-day-old moon 4° north of Venus. A telescopic view will reveal the planetary disk 10″ in diameter and nearly circular.

Earth will reach heliocentric longitude 270° on June 21st at 18^h 03^m UT, summer commencing in the Northern Hemisphere and winter in the Southern.

Mars appears as an inconspicuous 2nd-magnitude object, rising 1½ hours before the sun by the end of the month. On June 24th, the planet will be 6° north of Aldebaran in the constellation of Taurus.

Jupiter rises about two hours after the sun sets, crossing fairly low in the southern sky. The planet is retrograding, and has increased in brightness to magnitude —2.2. It is in Capricornus this month.

Saturn, visible before midnight, may be found about a degree east of Regulus in Leo. This month and next provide the last opportunity for two years to view Saturn's rings favorably. They are 10° open now and slowly closing, with the southern face visible. By December, the rings will be 1° inclined as seen from our earth. In June, the major axis of the system is 39″ in diameter and the minor axis 6″; the planetary disk is 15″ across.

Uranus cannot be seen; conjunction with the sun occurs on June 22nd.

Neptune appears on the meridian in the early evening, favorably placed for viewing. Neptune is about ½° west of 38 Virginis and is 8th magnitude. The position on the 15th is 12^h $48^m.2$, —3° 26′ (1950).

E. O.

4632	40.0	0 11	12.1	3.2-1.0	Sc
4636	40.3	2 57	10.8	1.2-1.1	E
4643	40.8	2 15	11.6	1.8-0.7	SBa
4653	41.4	—0 18	13.1	....	....
4665	42.6	3 19	11.8	1.2-	Sa
4666	42.6	—0 12	11.3	4.0-0.5	Sc
4668	43.0	—0 17	13.0	....	....
4688	45.3	4 36	13.0	....	....
4698	45.8	8 45	12.2	2.7-0.9	Sa
4701	46.6	3 39	12.8	0.9-0.8:	E:
4713	47.5	5 35	12.3	2.4-1.7	Sc
4753	49.8	—0 55	10.5	2.7-	I
4765	50.7	4 45	12.9	0.6-0.4	....
4771	50.8	1 33	12.9	4.2-0.6	S
4772	51.0	2 27	12.6	3.0-1.0	S
4795	52.5	8 20	13.1	....	....
New 4	52.6	0 23	12.9	3.3-2.5	S
4808	53.3	4 35	12.5	2.2-0.8	Sc
4845	55.5	1 51	12.6	4.0-0.9	S:
4900	58.2	2 46	11.8	1.7-1.7	Sp
4904	58.4	0 15	12.8	2.0-1.0	S:

OCCULTATION PREDICTIONS

A nearly full moon occults the 1st-magnitude star Antares on the evening of June 9th for observers in the northeastern United States and Canada. Elsewhere, observers should watch for a grazing occultation or a close conjunction.

June 9-10 **Alpha Scorpii** 1.2, 16:26.3 —26-19.2, 13, Im: **A** 2:39.8 —1.0 —0.3 138; **B** 2:38.0 —1.0 —0.1 135; **C** 2:38.3 —0.5 —0.9 154; **D** 2:33.6 —0.6 —0.4 147; **E** 2:43.4 ... ... 193. Em: **A** 3:48.3 —2.1 +0.2 263; **B** 3:47.0 —1.9 +0.2 266; **C** 3:36.1 —2.5 +0.8 251; **D** 3:34.6 —2.1 +0.7 257; **E** 2:55.0 ... ... 213.

For standard stations in the United States and Canada, for stars of magnitude 5.0 or brighter, all data from the **American Ephemeris** and the **British Nautical Almanac** are given here, as follows: evening-morning date, star name, magnitude, right ascension in hours and minutes, declination in degrees and minutes, moon's age in days, immersion or emersion; standard station designation, UT, **a** and **b** quantities in minutes, position angle on the moon's limb; the same data for each standard station westward.

Longitudes and latitudes of standard stations are:

A +72°.5, +42°.5 **E** +91°.0, +40°.0
B +73°.6, +45°.6 **F** +98°.0, +30°.0
C +77°.1, +38°.9 **G** +114°.0, +50°.9
D +79°.4, +43°.7 **H** +120°.0, +36°.0
I +123°.1, +49°.5

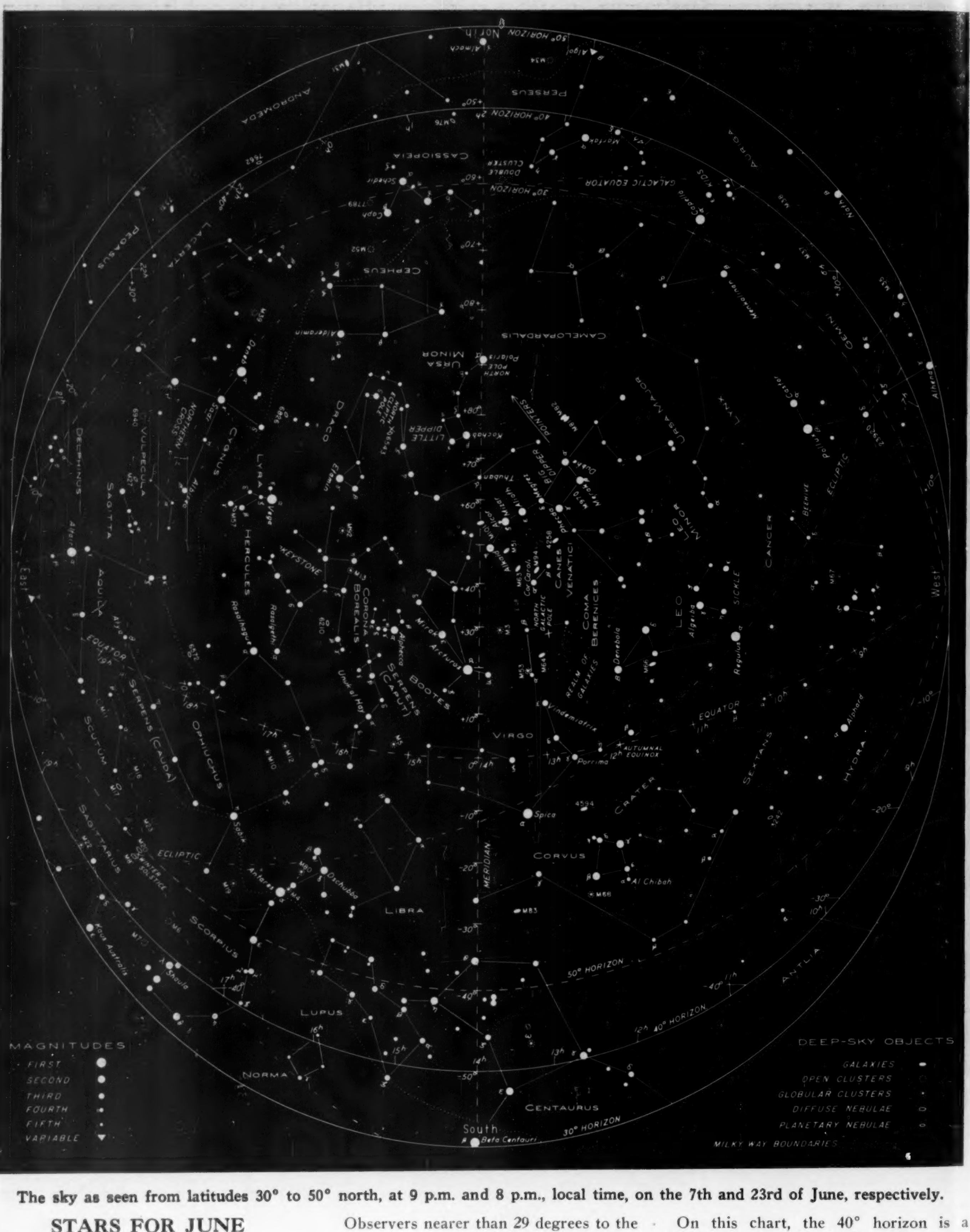
The **a** and **b** quantities tabulated in each case are variations of standard-station predicted times per degree of longitude and of latitude, respectively, enabling computations of fairly accurate times for one's local station (long. **Lo**, lat. **L**) within 200 or 300 miles of a standard station (long. **LoS**, lat. **LS**). Multiply **a** by the difference in longitude (**Lo — LoS**), and multiply **b** by the difference in latitude (**L — LS**), with due regard to arithmetic signs, and add both results to (or subtract from, as the case may be) the standard-station predicted time to obtain time at the local station. Then convert the Universal time to your standard time.

MINIMA OF ALGOL

June 3, 15:51; 6, 12:40; 9, 9:29; 12, 6:17; 15, 3:06; 17, 23:55; 20, 20:43; 23, 17:32; 26, 14:21; 29, 11:10. July 2, 7:58; 5, 4:47; 8, 1:36; 10, 22:24.

UNIVERSAL TIME (UT)

TIMES used on the Observer's Page are Greenwich civil or Universal time, unless otherwise noted. This is 24-hour time, from midnight to midnight; times greater than 12:00 are p.m. Subtract the following hours to convert to standard times in the United States: EST, 5; CST, 6; MST, 7; PST, 8. If necessary, add 24 hours to the UT before subtracting, and the result is your standard time on the day preceding the Greenwich date shown. Daylight time is one hour in advance of standard time.



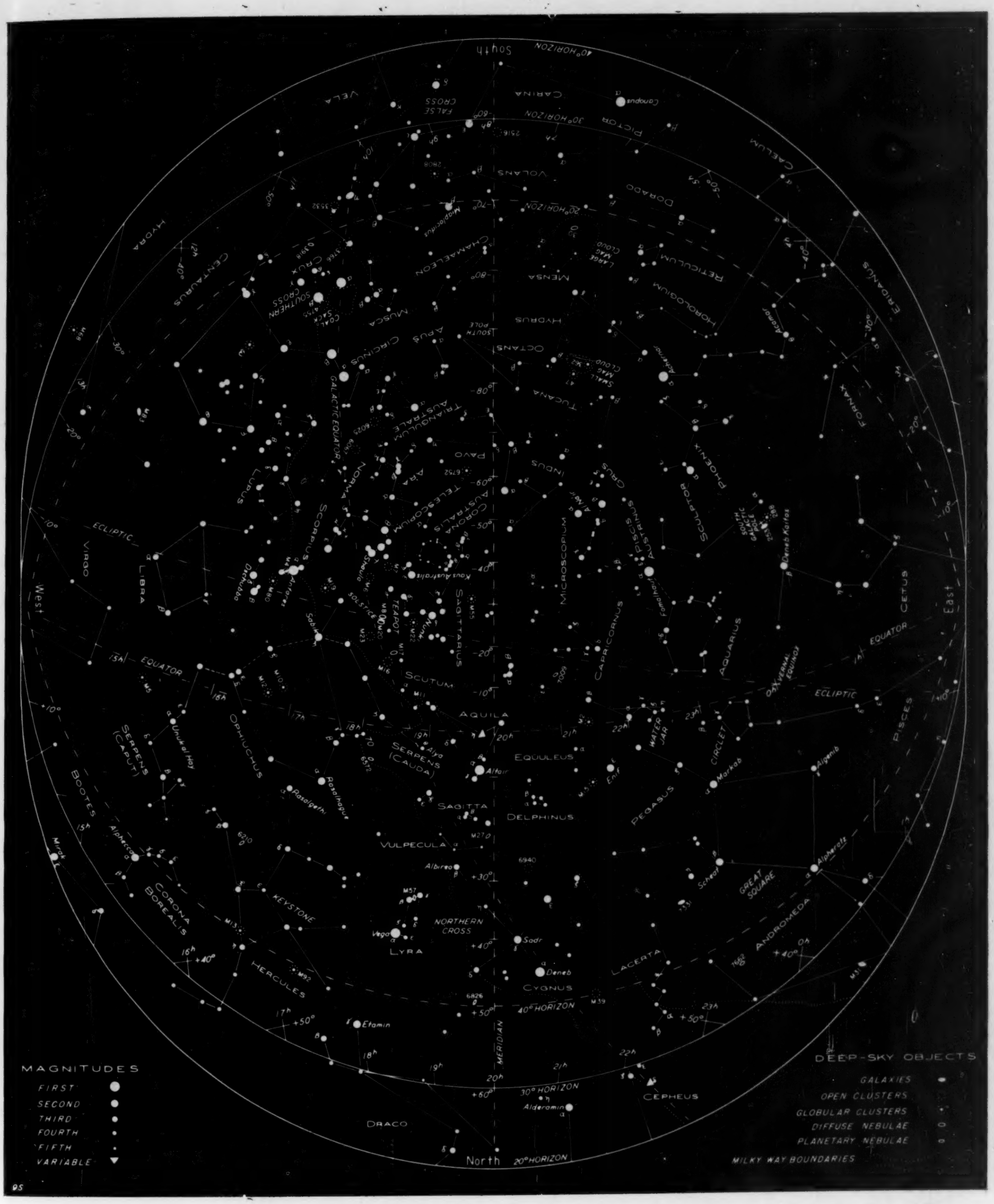
The sky as seen from latitudes 30° to 50° north, at 9 p.m. and 8 p.m., local time, on the 7th and 23rd of June, respectively.

STARS FOR JUNE

TRANSITION from the skies of late winter to those of early summer is now complete, for in the southeast at sunset the Scorpion is already mostly above the horizon, while Arcturus and Spica dominate the central heavens. In the west, Hydra is beginning his long slide down the sky, taking Leo and Corvus with him.

Observers nearer than 29 degrees to the equator can observe Alpha Centauri, nearest star to the sun, and Beta Centauri, which appears just at the south point of the meridian at our chart time. But for these observers Capella has set in the northwest, whereas for those who live midway between the poles the "she-goat" is circumpolar. Capella is at a distance of 42 light-years, is a yellow star like the sun, but intrinsically 150 times brighter.

On this chart, the 40° horizon is a solid circle; the other horizons shown are circles too, but dashed in part. When facing north, hold "North" at the bottom, and similarly for other directions. This chart is on a stereographic projection, in which the flattened appearance of the sky is closely reproduced, with minimum distortion. The chart may be used for other days and times than stated above, four minutes earlier per day.



The sky as seen from latitudes 20° to 40° south, at 9 p.m. and 8 p.m., local time, on the 7th and 23rd of September, respectively.

SOUTHERN STARS

WHILE the very bright regions of the Milky Way discussed in the April issue still dominate the central sky for southern observers, to the north is that rich region which contains the three bright stars, Altair, Vega, and Deneb. The Swan is flying up the meridian, while over in the northeast Pegasus is seen right side up by Southern Hemisphere observers.

Observers with telescopes can find numerous objects of all types in this September sky. Globular clusters are particularly inviting, M4, M5, M10, M12, M19, M22, M55, and M80 west of the meridian, as well as Omega Centauri, and NGC 6752 in Pavo. Among the eastern constellations are globular clusters M2, M15, and NGC 288, as well as 47 Tucanae, and NGC 362 in the Small Magellanic Cloud. These globulars may be compared with the numerous open or galactic clusters that lie along the Milky Way.

Our southern charts are prepared for a basic latitude of 30° south, but they may be used conveniently as much as 20 degrees farther north or south. They are published in alternate months. The sky here is also as it appears on August 7th at 11 p.m. and August 23rd at 10 p.m., local time. Times for other days vary similarly, four minutes earlier per day.